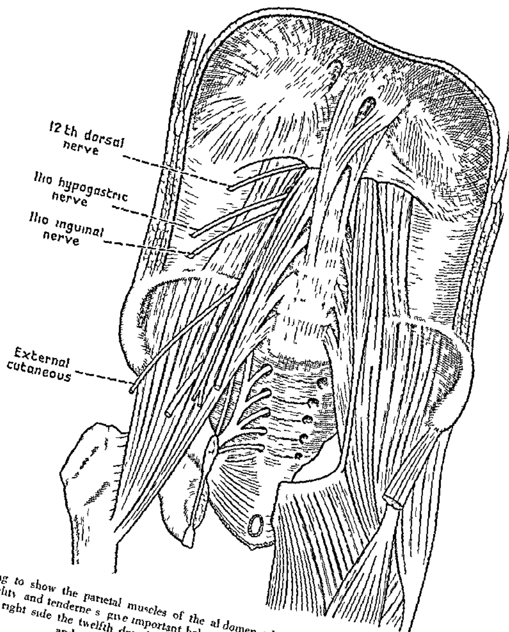
THE EARLY DIAGNOSIS OF THE ACUTE ABDOMEN



Drawing to show the parietal muscles of the abdomen which by their rigidity immobility and tenderness give important help in diagnosis of the acute abdomen On the right side the twelfth dorsal nerve and the ilio hypogastric ilio inguinal, and external cutaneous nerve are indicated

Frontispiece

THE EARLY DIAGNOSIS OF THE ACUTE ABDOMEN

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PREFACE TO THE ELEVENTH EDITION

In this, the eleventh edition, I have taken the opportunity to revise the whole book and to make several important additions During the last few years vascular surgery and the operative treatment of intestinal obstruction in the new born have made great strides forward so that conditions which were not so long ago regarded as almost hopeless can now, in a reasonable proportion of cases, be alleviated or remedied I have therefore added sections dealing with the diagnosis of these serious conditions

I have also added a chapter designed to help the practitioner to come to a diagnosis in any particular case which may come under his observation This chapter is modified from an article which I wrote in 1953 for the well known American medical journal *G P*, and I am grateful to the editor and publisher of that journal for permission to make use of the material Paragraphs have also been included dealing with several conditions which have recently become better understood and more definitely diagnosed, e g jejunal diverticulitis and volvulus of the stomach A number of new illustrations have been inserted and I wish particularly to thank Dr Rohan Williams who has kindly provided a number of excellent radiographs

I hope that in this revised form the book may continue to be of help to students house officers and particularly to those in general practice from whom I have received so many welcome testimonies of the assistance it has given them

Zachary Cope

LONDON
JUNE 1957

EXTRACT FROM THE

PREFACE TO THE FIRST EDITION

All who have had much experience of the group of cases known generally as the acute abdomen will probably agree that in that condition early diagnosis is exceptional There are still many who do not appreciate to the full the significance of the earlier and less flagrant symptoms of acute abdominal disease who regard an increased frequency of the pulse and rigidity of the overlying abdominal muscles as necessary accompaniments of the early stage of appendicitis, or find it hard to believe that a patient with a non-distended abdomen and normal pulse and temperature can be the victim of a perforated gastric ulcer

It would appear, therefore that there is room for a small book dealing solely with the early diagnosis of such cases for there is little need to labour the truism that earlier diagnosis means better prognosis Though the present attempt to supply the deficiency may be inadequate the author has at least endeavoured to assist the reader to attain a correct judgment in the evaluation of the various puzzling symptoms present in urgent abdominal disease

Few references are inserted and no bibliography is appended for whilst the writer readily acknowledges the great debt which he owes to the teaching of such leaders as Murphy, Moynihan Rutherford Morison Maylard and many others it has been his aim to put down nothing which has not been frequently confirmed and demonstrated in his own experience

At the same time he has introduced many diagnostic points which he believes have either never previously been recorded or to which insufficient attention is usually paid In the former category may be mentioned the localizing diagnostic value of phrenic shoulder pain the obturator test and the test for differentiating between pain of thoracic and abdominal origin whilst in the latter the area of hyperæsthesia caused by a distended inflamed appendix the pathognomonic axillary area of liver resonance in cases of perforated ulcer, the psoas extension test and the confusing significance of testicular pain, serve as examples

ZACHARY COPE

LONDON
June 1921

LIST OF PLATES

There is surely no greater wisdom than well to time the beginning and onsets of things'—BACON *Essay on Delay*

I

THE PRINCIPLES OF DIAGNOSIS IN ACUTE ABDOMINAL DISEASE

BEFORE ENTERING on the detailed consideration of the methods of examination of the various forms of the acute abdomen it is well to lay down certain principles which form the basis of all successful diagnosis in urgent abdominal disease

NECESSITY OF MAKING A DIAGNOSIS

The first principle is that of the *necessity of making a serious and thorough attempt at diagnosis*

Abdominal pain is one of the most common conditions which call for speedy diagnosis and treatment Usually, though by no means always there are other symptoms which accompany the pain but in the majority of cases of acute abdominal disease pain is the main symptom and complaint The very terms 'acute abdomen and abdominal emergency," which are constantly applied to such cases signify the urgent need for prompt diagnosis and active treatment It is common knowledge, however that when confronted with a patient suffering great abdominal pain it is often very difficult to be certain as to the exact intra abdominal lesion which has given rise to the symptoms In some instances the urgent need for surgical assistance may be so obvious that the need of transference of the patient to a surgical centre is clear In other cases the observer may if in doubt think it discreet to discuss the problem with a fellow practitioner before deciding on any course of action There are, however, occasions when, with somewhat indefinite symptoms there may be a tendency to wait for the development of clearer indications to see if the condition will not improve spontaneously and generally to temporize The last course of conduct is the least justifiable for it is a wise plan always to make a very thorough attempt to elucidate the problem when the patient is seen for the first time Though in quite a number of cases it is impossible to be sure of the diagnosis yet it is a good habit to come to a decision in each case and it will be found that after a short time provided that no method of diagnosis be neglected the percentage of correct diagnoses will rapidly increase

That there is much room for improvement in this direction cannot be gainsaid Even the operating surgeon is not free from blame in this

matter, for the ease and comparative safety of operating occasionally cause him to make a rather perfunctory examination of some patients whom from previous experience he judges to be in urgent need of abdominal section If every surgeon were to make an exhaustive attempt at a full diagnosis before operating the science of elucidation of acute abdominal disease would be advanced considerably There is no field in which diagnosis should be so precise since in no class of cases has the surgeon so great an opportunity of correlating the symptoms with the pathology of the living

It is only by thorough examination that one can propound a diagnosis, and if the early stages of the disease are to be recognized note must be taken of the earliest symptoms General practitioners have better opportunities than any other section of the medical community for observing these early symptoms and by patient and painstaking observation it is possible for them to add greatly to the stock of common knowledge To attempt a diagnosis prevents carelessness, and carelessness in urgent abdominal diagnosis is close akin to callousness

It is a truism to say that correct diagnosis is the essential preliminary to correct treatment Many and serious results have followed from an observer jumping to wrong conclusions which might easily have been avoided by a real attempt at clinical differentiation

Spot diagnosis may be magnificent, but it is not sound diagnosis It is impressive but unsafe The deduction and induction from observed facts necessary for the formation of a definite opinion are good mental discipline for the observer, help to imprint upon the tables of the mind perceptions and clinical pictures which can usefully be recalled in the future and give a sense of satisfaction which is only slightly diminished if the resulting opinion should prove to be incorrect One often, if not always learns more by analysing the process of and detecting the fallacy in an incorrect diagnosis than by taking unction to oneself when the diagnosis proves correct

EARLY DIAGNOSIS

There can be no question that in acute abdominal disease it is of the utmost importance to *diagnose early* Like the business man who takes as his motto "Do it now,' the medical man when confronted with an urgent abdominal case, should have ever before him the words Diagnose now" The patient cries out for relief the relatives are insistent that something shall be done, and the humane disciple of Æsculapius may think it his first duty to diminish or banish the too obvious agony by administering a narcotic Such a policy is often literally a fatal mistake Though it may appear cruel it is really kind

to withhold morphine until one is certain whether or not surgical interference is necessary, i e until a reasonable diagnosis has been made Morphine does little or nothing to stop serious intra abdominal disease but it puts an efficient screen in front of the symptoms The fire burns but it is not visible, and sometimes only when vitality is burnt out is the mistake realized If morphine be administered it is possible for a patient to die happy in the belief that he is on the road to recovery, and in some cases the medical attendant may for a time be induced to share the delusive hope

It is a curious but well known fact that many who are taken with abdominal pain in the daytime endure till evening before they feel compelled to send for the doctor It follows that important decisions often have to be made at night when the physician weary with the day's work, and with perceptions and reasoning faculties somewhat jaded, is both physically and mentally below his best The temptation is often very strong to temporize and see how things are in the morning" There can be few practitioners of experience who cannot look back with regret to one or more occasions when delay has been fraught with disaster The waiting attitude is understandable, but only occasionally excusable To suspect an intussusception, to think that possibly there may be a perforation of a gastric ulcer and yet to leave the question undecided for eight or ten hours is to gamble with a life A delay of two hours in diagnosis may make the difference between two weeks' and two months illness of the patient The fact that the patient comes late to the doctor is all the greater reason why he should diagnose as soon as possible *The general rule can be laid down that the majority of severe abdominal pains which ensue in patients who have been previously fairly well and which last as long as six hours are caused by conditions of surgical import* There are exceptions but the generalization is useful if it serves to call attention to the need for early diagnosis Surgical intervention is usually required for perforated ulcers for appendicitis, for intestinal obstruction and many other conditions and it is well recognized that the earlier such conditions are dealt with by the surgeon the better the results When it is remembered however that the first successful suture of a perforated gastric ulcer was performed less than seventy years ago that the removal of a diseased appendix has only been a practical surgical question for about the same time that opening the abdomen for intestinal obstruction was regarded at the beginning of this century as the last instead of the first resort it will be recognized that the modern mental attitude toward abdominal emergencies has only been adopted within the lifetime of this generation But the old view that delay is permissible still lingers in some quarters for custom changes

slowly Public opinion on the subject needs education, and such education must come *from the practitioner* Since this book was first published, the benefit of surgical intervention in acute abdominal conditions has become recognized by the public, and it is rare to find patients who refuse to undergo any operation which is strongly advised by the surgeon

The recovery rate from acute abdominal disease increases in proportion to the earliness of diagnosis and treatment During the past two decades there has been a considerable reduction in the mortality of acute abdominal diseases in England and Wales particularly in the case of the infective processes In the decade 1938–48 the annual number of deaths from appendicitis dropped from 3 027 to 1,257, and in the succeeding seven years this number had been reduced to 845, a very remarkable and welcome improvement This may have been due to several causes—the introduction of the sulphonamides and the antibiotics, or the increase in the number of trained surgeons, but we believe it likely that some of the improvement may have been due to earlier diagnosis This view is supported by the fact that during the period from 1938 to 1955 the annual mortality from ectopic gestation dropped steadily from 75 to 22, for in this condition early diagnosis is of great importance and the course of the disease is not influenced by drugs which control infection

There has also been an improvement, though not to the same extent, in the results of operative treatment of intestinal obstruction and strangulated hernia The number of deaths from these causes in 1945 was 3,531, while in 1955 this figure had been reduced to 2 613 There is, however, still considerable room for improvement in the diagnosis of the early symptoms of intestinal obstruction and in the realization that operation is safer than prolonged taxis in the case of a strangulated hernia

THOROUGH ROUTINE EXAMINATION

The necessity of the principle of making a *thorough routine examination* of every acute abdominal case should not need much emphasis If one is to make a correct diagnosis a complete routine examination *should be the rule Few omit to feel the pulse* and take the temperature—yet many a serious abdominal crisis may show at the time of examination a normal pulse and temperature It is more important to insert the finger into the lower end than to put the thermometer into *the upper end of the alimentary tract More early cases* will be diagnosed by palpating the pelvic peritoneum than by palpating the pulse Few would forget to ask whether the bowels were constipated or not but many might forget that it is quite as important to submit the urine

to the chemical question of boiling In the most perfunctory examination one is almost bound to lay the hand on the patient's abdomen, and if the latter be tender and rigid, the assumption may be made that the condition is a local peritonitis though a stethoscope applied to the lower part of the chest might possibly reveal the fact that the origin of the symptoms was a diaphragmatic pleurisy

The exact order or method of examination which one may follow is a matter of individual choice or preference but the routine followed by the writer is indicated and described in the succeeding chapters

KNOWLEDGE OF ANATOMY

Many examinations of the abdomen are imperfect because the practitioner does not act upon the important *principle of applying his*

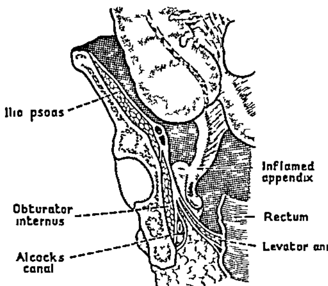


FIG 1—Drawing to show anatomical parts concerned in the obturator test

knowledge of anatomy It is well to cultivate the habit of thinking anatomically in every case where the knowledge of structural relations can be put to advantage There are very few abdominal cases in which this cannot be done Application of anatomy makes diagnosis more interesting and more rational The explanation of some doubtful point the differentiation of the possible causes of a pain the determination of the exact site of a diseased focus often depend upon small anatomical points One is accustomed to marvel at the accurate

diagnoses of the neurologist, which are for the most part based upon a sound knowledge of microscopic anatomy Nothing like the same accuracy is yet achieved in abdominal diagnosis but it is the writer's faith that such will come in time by carefully applying the knowledge of anatomy and physiology

One can best illustrate the value of applied anatomy in abdominal diagnosis by considering those structures which are least variable in

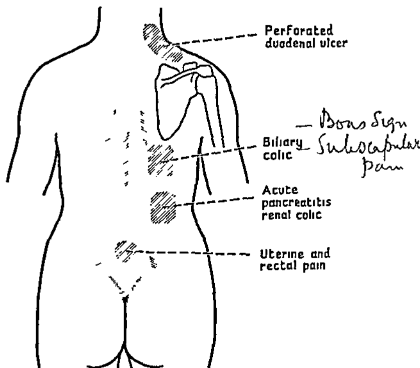


FIG 2—Diagram to show the sites on posterior surface of body to which pain is referred in acute abdominal conditions

their position—the voluntary muscles and the cerebro spinal nerves The frontispiece shows well the position of the different muscles the diaphragm the psoas the quadratus lumborum the erector spinæ the lateral abdominal muscles the recti, the pyriformis and the obturator internus Each of these muscles may be of valuable clinical significance for if any of them be irritated directly or reflexly by inflammatory changes it becomes tender and rigid and pain is caused when the muscle fibres are moved Everyone is acquainted with the rigidity of the rectus and lateral abdominal muscles when there is a subjacent inflammatory focus but few take much note of the rigidity

of the diaphragm in a case of subphrenic abscess, because the dia phragm is invisible and impalpable Its immobility may be deduced however, by the impairment of movement of the upper part of the abdominal wall and if the X rays are available the rigidity and absence of movement of the diaphragm can be directly demonstrated

It will be remembered that in some cases of appendicitis and other conditions affecting the psoas muscle there is flexion of the thigh, due to contraction of the muscle consequent on direct or reflex irritation but how often does anyone test the slighter degrees of such irritation by causing the patient to lie on the opposite side and extending to the full the thigh on the affected side? Again the obturator internus is covered by a dense fascia and is not readily irritated by pelvic inflam mation but if there be an abscess (e g one caused by a ruptured appendix) immediately adjacent to the fascia pain will be caused if the muscle be put through its full movement by rotating the flexed thigh inward to its extreme limit The pain is referred to the hypo gastrium This sign is not present in every case of pelvic appendicitis, and may occur in other pelvic conditions, such as pelvic hæmatocele but when present it denotes a definite pathological change (Fig 1)

The application of the knowledge of the anatomical course and distribution of the segmental nerves is also important When a patient complains of loin pain radiating to the corresponding testis one remembers the embryological fact that the testis is developed in the same region as the kidney, and though the former travels to the scrotum just before birth yet in suffering it shows its sympathy with and serves as an indicator for the intra abdominal structure which was developed near it Of course pain referred to the testicle does not always denote primary genito urinary disease It is probable that the main nerve supply to the vermiform appendix comes from the tenth dorsal segment, so that pain in one or both testicles may be caused by such a condition as appendicitis The dorsal distribution of referred pain should also be noted (See Fig 2)

Another segmental pain of great importance is that referred from the diaphragm The diaphragm begins to develop in the region of the fourth cervical segment from which is obtained the major part of its muscle fibres Nerve fibres mainly from the fourth cervical nerve accompany the muscle fibres and constitute the phrenic nerve The growth of the thoracic contents causes the muscle to be displaced caudal wards and it finally takes up its position at the lower outlet of the thorax The phrenic nerves elongate to accommodate themselves to the displaced muscle From the diagnostic point of view the separation from the original position is extremely valuable for if in upper abdominal or lower thoracic lesions pain be felt or hyper

æsthesia be detected in the region of distribution of the fourth cervical nerve, it is a strong presumption that the diaphragm is irritated by some inflammatory or other lesion Hilton was one of the first to suggest that the shoulder pain might be referred to the shoulder via the phrenic nerve, and Ferguson proved experimentally over sixty years ago that the phrenic nerve contained afferent as well as efferent fibres Yet the significance in abdominal diagnosis of constant or intermittent pain in the region of distribution of the fourth cervical nerves is still either not understood or seriously neglected Pain on

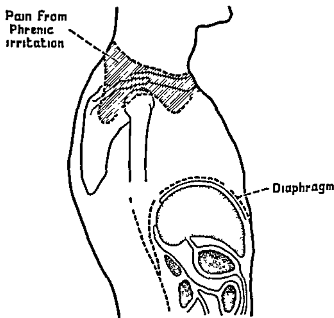


FIG 3 —Diagram to indicate the shoulder area in which phrenic irritation may cause pain

top of the shoulder may be the only signal which an inarticulate liver abscess, threatening to perforate the diaphragm may be able to produce When a gastric ulcer perforates, the escaping fluid may impinge on the lower surface of the diaphragm irritate the terminations of the phrenic nerve on one or both sides and cause pain on top of one or both shoulders Pain may also be referred to the shoulder in cases of subphrenic abscess diaphragmatic pleurisy acute pancreatitis, gall stones ruptured spleen and in some cases of appendicitis with peritonitis The pain is felt either in the supraspinous fossa, over the acromion or clavicle or in the subclavicular fossa (Fig 3) There is clinical evidence to support the opinion that there is a correspondence of

nerve distribution over the diaphragm and over the acromio clavicular region so that lesions affecting a certain portion of the diaphragm cause pain over the corresponding part of the shoulder area on the same side of the body Pain on top of both shoulders indicates a median diaphragmatic irritation The shoulder pain is apt to be over looked, since the patient may term it ' rheumatism ' (Fig 4) Some times when the diaphragm is irritated by a neighbouring lesion as by blood from a ruptured spleen tenderness may be elicited by

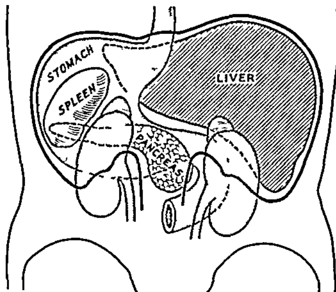


FIG 4—Diagram to show the relationship of viscera with the diaphragm (Posterior view with back part of diaphragm cut away)

pressure on the corresponding phrenic nerve in the neck (Saegesser)

Errors in diagnosis also result from want of appreciation of another anatomical point i e the lack of representation in the muscular abdominal wall of the segments which form the pelvis so that irrita tion of the pelvic nerves (e g from pelvic peritonitis) causes no ab dominal wall rigidity Peritonitis commencing deep in the pelvis may therefore be unaccompanied by any rigidity of the hypogastric abdominal wall

The general principle may be laid down that rigidity of the muscular wall of the abdomen in response to irritation varies in proportion to the extent of the cerebro spinal nerve supply to the subjacent peritoneum

Indeed, the whole of the peritoneal lining of the abdomen may be divided into demonstrative and non demonstrative areas the former causing reflex muscular rigidity and the latter not doing so The pelvis and the central part of the posterior abdominal wall may be the site of an acutely inflamed appendix or an abscess, and yet there may be no overlying rigidity of the muscles Hence the difficulty of diagnosing a pelvic or a retro ileal inflamed appendix

The above illustrations serve to demonstrate the importance of applying knowledge of anatomy in abdominal diagnosis It is un necessary to emphasize the great importance that a thorough acquain tance with the normal size, position, and relations of the abdominal viscera has in connexion with the elucidation of abdominal disease

KNOWLEDGE OF PHYSIOLOGY

The localization of inflammatory lesions is aided particularly by knowledge of anatomy, whilst in obstructive lesions the application of physiological knowledge plays perhaps a more important part The question of shock, the nature of the movements and sensations of the intestine not to mention the various and important physiological tests demonstrating visceral functional derangements, are all intimately bound up with the problem of the acute abdomen Very important also is the study of the effect of various toxins upon the viscera and the neuro muscular reflexes of the abdomen

A very large number of urgent abdominal cases are accompanied by pain due to abnormal conditions in tubes whose walls are compo ed mainly of unstriped muscle fibres There is no high grade sensibility in such tubes It is possible to crush cut, or tear intestine without the fully conscious patient experiencing any pain, yet everyone is aware that pain does take origin from the intestine What induces such pain? The required stimulus is stretching or distension of the tube or excessive contraction against resistance Evidence of pain arising from a tube of involuntary muscle is therefore indicative of local distension, either by gas or fluid, or of vigorous contraction In mild degrees in the intestine this is commonly called flatulence in greater degrees *in intestinal, biliary, renal, and uterine tubes it is* called colic Severe colic always indicates obstruction causing local distension or violent peristaltic contraction It occurs in paroxysms and the pain, which is often of an excruciating nature, is referred to the sympathetic centre from which the nerves come, and also to the segmental distri bution corresponding to the part of the spinal cord from which the sympathetic nerves to the affected viscus are derived Colic of the small intestine causes pain referred chiefly to the epigastric and um bilical regions whilst large intestine colic is usually referred to the

hypogastrium The pain of biliary colic is usually felt more in the right subscapular region, whilst that of renal colic is felt in the loin and sometimes radiates to the corresponding testicle Severe colic is certainly one of the most terrible trials to which a human being can be subjected The excessive stimulation of the nerve centres is often reflected into motor channels so that the patients frequently fling themselves about twist and double themselves up in a characteristic way If, therefore a patient gets paroxysms of pain which are accompanied by the most violent restlessness of agony the chances are that the condition is some form of obstruction and not peritonitis, for in the latter condition movement generally increases the pain

The physiology of shock is still a subject of discussion, and rather widely differing opinions are held thereon But whatever views be held as to the exact metabolic or nervous changes which are responsible for the symptoms we believe that few would fail to allow that in acute abdominal disease two varieties can be recognized One is the initial or primary shock due to sudden stimulation of many nerve terminals as in the perforation of a gastric ulcer into the general peritoneal cavity or the severe stimulation of a few, as for example in severe biliary colic

The second variety of shock which might be termed late toxic or secondary shock, is that in which somewhat similar symptoms arise at a later stage partly no doubt from severe afferent nerve stimulation sometimes from loss of fluid from the blood vessels into the extra vascular tissues but often from the absorption of poisons which directly affect the higher nerve centres The terminal stage of this secondary shock is commonly termed collapse

Between primary and secondary shock as here described there is often an interval a latent period, during which the observer may easily be deceived In many ca es of perforated ulcer the sudden stimulation of the nerve endings in the peritoneum or subperitoneal tissue causes evere shock After a time the irritative fluid is diluted by the out pouring of serum the nerve equilibrium is restored and the pulse respiration temperature and appearance of the patient improve so much that one might think the pathological process was stayed or improving Soon, however, the symptoms of peritonitis dominate the scene and one realizes that the calm period was but that of physiological reaction This period is the cause of many mistakes in diagnosis

Another physiological fact of importance is that hyperæsthe ia and tenderness due to irritation of nerves by a unilateral lesion are not usually felt on the opposite side of the body For example a right sided pleurisy will sometimes cause tenderness and rigidity in the right but not in the left iliac region If the fingers pressed well into the left iliac fossa and pushed deeply towards the right side across the

middle line evoke tenderness, it will indicate a deep inflammatory lesion in the right iliac region

EXCLUSION OF MEDICAL DISEASES

In diagnosing acute abdominal disease it is *always necessary to exclude medical diseases* before concluding that the condition is one needing surgical intervention Certain aspects of disease which may simulate the acute abdomen can only be learnt either in the medical wards of a large hospital or in an extensive general medical practice Typhoid fever cardiac derangements chronic interstitial nephritis and arteriosclerosis cirrhosis of the liver tuberculous peritonitis—all these and many other medical diseases will sooner or later cause doubt in abdominal diagnosis The one who would be prepared thoroughly to examine and correctly to diagnose the acute abdomen must at any rate know how to use even if he be not expert in the use of, the ophthalmoscope the sphygmomanometer the leucocytometer, and the stethoscope—not to mention the urine testing apparatus

Opening of the abdomen is not to be advised with too light a heart The dextrous hand must not be allowed to reach before the imperfect judgment Abdominal section is only to be made on the recommenda*tion of a mature judgment after a thorough examination* It is regrettable to have to say afterwards that one did not know that there was severe albuminuria or that the patient was the subject of tabes dorsalis, or that the lungs were not examined Perhaps the traditional precedence of the physician over the surgeon is not without its significance even to day

If, however, after careful examination one comes to the conclusion *that there is within the abdomen the early stage of a pathological* process which tends to get worse and which is amenable to surgical treatment there should be no hesitation in recommending operation even though the patient and his relatives may not think the condition serious Correct diagnosis is the basis of firm counsel

II

METHOD OF DIAGNOSIS

1 THE HISTORY

IN DIAGNOSING acute abdominal disease it is well to have a routine method of examination not to be slavishly followed, but to be modified according to circumstances Increasing experience enables one to dispense with some parts of the examination—for example, a woman collapsed and blanched with obvious intra abdominal hæmorrhage is not to be subjected to an examination which entails a risk of producing further hæmorrhage—but in general and when urgency permits, routine method is desirable

The accompanying scheme to be filled in during the examination of the patient was used by me at St Mary s Hospital for some years and may be found useful as a general guide There are two main sections in this scheme one devoted to the ascertaining of the history of the condition for which advice is sought, the other reserved for the result of the physical examination of the patient The former includes both the story of the present illness and any more remote disease which may possibly bear upon the present derangement

HISTORY OF PRESENT CONDITION

It can be confidently asserted that a large number of acute abdominal conditions could be diagnosed by considering carefully the history of onset That is only possible however when each symptom is carefully appraised in relation to the other symptoms so that its significance is properly understood We shall therefore consider each item in the scheme separately

Age

To know a patient s age is helpful since the incidence of certain conditions is limited within a particular range of years Acute intussusception in temperate climates occurs generally in infants under two years of age, appendicitis seldom occurs in infancy but is most common in young adolescents Obstruction of the large intestine by a cancerous stricture is seldom seen before thirty, is infrequent before forty but is the commonest cause of intestinal obstruction in persons over forty years of age Acute pancreatitis is seldom seen in those under middle age A perforated gastric ulcer is a rarity in

FORM FOR ACUTE ABDOMINAL CASES

Patient's Name *Sex* *Age*

Address

Date and time of examination

HISTORY OF PRESENT CONDITION

EXACT TIME OF ONSET MODE OF ONSET —Acute or Gradual.

PAIN —(*a*) Situation at first (*b*) Has it shifted?
(*c*) Character (*d*) Any radiation?
(*e*) Pain on micturition

VOMITING —Before—at same time—or some hours after pain
How often? Character of vomit

NAUSEA

BOWELS —Regular usually? When last open
Diarrhœa? Any blood in motions?

MENSTRUATION —Exact date of last period
Whether last period + or − Painful or not

PAST HISTORY

Any serious previous illness?

INDIGESTION —If so how long after meals before pain comes
Jaundice Melæna Hæmatemesis
Hæmaturia Loss of weight

CONFINEMENTS (if any)

PRESENT CONDITION

PULSE BLOOD PRESSURE RESP TEMP

GENERAL APPEARANCE

ABDOMEN —Pain Tenderness Cutaneous Hyperæsthesia Rigidity Distension
Movement on respiration Tumour or external hernia.
Free fluid Liver dullness
Thigh rotation test

RECTAL EXAMINATION

CHEST EXAMINATION

SPINE KNEE JERKS PUPILS

URINE —Blood Pus Albumin Sugar

VAGINAL DISCHARGE

BIMANUAL EXAMINATION X RAY EXAMINATION

anyone under fifteen years Conditions such as cholecystitis or a twisted pedicle of an ovarian cyst may occur in childhood, though much more common in adult life All the acute conditions which are due to derangements of the developing ovum or its surroundings are naturally only found in women between the limits of the child bearing period

EXACT TIME AND MODE OF ONSET

It is frequently possible for the patient to fix the exact time at which the pain started The awakening out of sleep by acute abdominal pain is so startling that it is not forgotten Acute appendicitis very commonly, and perforation of a gastric ulcer not infrequently, commence in this manner It is no ordinary pain which begins thus

Many acute conditions appear to be precipitated by some slight exertion or by the internal disturbance cau ed by the energetic working of an aperient Many cases of incipient appendicitis become much worse soon after the administration of castor oil or its equivalent The temporary increase of intra-abdominal tension caused by any slight straining effort may cause the giving way of the thin floor of a gastric ulcer or the rupture of a pregnant Fallopian tube

It is also important to determine whether the condition began immediately after some injury apparently trivial abdominal injuries may be accompanied or followed by serious lesions

ACUTENESS OF ONSET —The acuteness of onset gives some indication of the severity of the lesion Ask if the patient fainted or fell down collapsed at the onset of symptoms Perforation of a gastric or duodenal ulcer and acute pancreatitis are the only two abdominal conditions likely *to cause a man to faint In a woman the rupture of an* ectopic gestation usually cau es fainting

Many cases of intestinal obstruction are gradual in onset culminating in an acute crisis Strangulation of the gut however is accompanied by very acute symptoms from the first The symptoms due to torsion of the pedicle of an ovarian cyst are also usually acute from the start

To know the exact time of onset is useful in estimating the probable pathological changes that have ensued for example it is not usual for an appendix to perforate within twenty four hours of the onset of symptoms so unless the symptoms definitely point to diffuse peritonitis one may give a better prognosis for the operation of appendicectomy if performed within that time Again it is only by ascertaining the precise moment of onset that one can tell whether the apparent well being of the patient corresponds to the stage of reaction which is seen in some conditions—notably in patients with perforated gastric or duodenal ulcer

PAIN ONSET, DISTRIBUTION, AND CHARACTER

The greatest importance attaches to the very careful consideration of the onset, distribution, and character of the pain

Situation of the pain at first

When the peritoneal cavity is flooded suddenly by either blood (from a ruptured tubal gestation sac), or pus (e g from a ruptured pyosalpinx) or acrid fluid (from a perforated gastric ulcer), the pain is frequently said to be felt "all over the abdomen" from the first But the maximum intensity of pain at the onset is likely to be in the upper abdomen in the last mentioned and in the lower abdomen in the two former conditions In perforated duodenal ulcer the pain may be at first more acute in the right hypochondrium and right lumbar and iliac regions, owing to the irritating fluid passing down chiefly on the right side of the abdomen

Pain arising from the small intestine, whether due to simple colic, organic obstruction, or strangulation is always felt first and chiefly in the epigastric and umbilical areas of the abdomen i e in the zone of distribution of the ninth to eleventh thoracic nerves which supply the small intestine via the common mesentery Remembering that the appendicular nerves are derived from the same source as those which supply the small intestine, it is not surprising that the pain at the onset of an attack of appendicitis is usually felt in the epigastrium When small intestine is adherent to the abdominal wall pain caused by its *peristaltic movement is referred to that part* of the abdominal wall to which the gut is adherent

The pain of large gut affections is more commonly felt at first in the hypogastrium, or, in the case of the cæcum and ascending and descending colon when the meso cæcum or meso colon is very short or wanting, at the actual site of the lesion

The shifting or localization of the pain

This is often significant After a blow on the upper part of the abdomen, if local pain at the site of injury be the first complaint but in a few hours the pain be referred more to the hypogastrium one must suspect rupture of intestine and consequent gravitation of the escaping fluid to the pelvis Similarly localization of pain in the right iliac fossa some hours after acute epigastric pain is usually due to appendicitis—though occasionally the same sequence is seen with a perforated pyloric or duodenal ulcer or in a case of acute pancreatitis When severe pain is first felt in the thorax but later felt more in the abdominal cavity one must at least consider the possibility of there being a dissecting aneurysm present

The character of the pain

This is occasionally a help as to the nature or seriousness of the condition The general burning pain of a perforated gastric ulcer, the agony of an acute pancreatitis the sharp constricting pain which takes away the breath in an attack of biliary colic the tearing pain of a dissecting aneurysm, and the griping pain in many cases of intestinal obstruction contrast with the acute aching of many cases of appendicitis with abscess, or the constant dull fixed pain of a pyonephrosis

Radiation of the pain

This is frequently diagnostic This is specially true of the colics, in *which pain radiates to the area of distribution of the nerves coming* from that segment of the spinal cord which supplies the affected part Thus in biliary colic the pain is frequently referred to the region just under the inferior angle of the right scapula (eighth dorsal segment) whilst renal colic is frequently felt in the testicle of the same side

In many conditions of the upper abdomen and lower thorax pain is referred to the top of the shoulder on the same side as the lesion (see Chapter I) and special inquiry should always be made as to pain or tenderness over the supra spinous fossa the acromion or the clavicle

It is always well to ascertain if the pain is influenced by respiration Pleuritic pain is usually worse on taking a deep inspiration and is diminished or stopped during a respiratory pause Biliary colic may cause inhibition of movement of the diaphragm and the pain may be increased by a forced respiration In many cases of peritonitis intra peritoneal abscess or abdominal distension due to intestinal obstruction pain will be caused on inspiration

Special varieties of pain

It is necessary to ask if there be any pain during the act of micturition for the *presence or absence of such pain is frequently of great* significance In addition to its causation by primarily urinary conditions e g pyelitis stone in the kidney or ureter or acute hydronephrosis pain on micturition is not infrequently caused by a pelvic abscess which lies close to the bladder, or by an inflamed appendix which irritates the right ureter Pain in the corresponding testicle may accompany renal colic but testicular pain may occasionally occur with appendicitis

VOMITING

In acute abdominal lesions apart from acute gastritis vomiting is almost always due to one or more of three causes

1 *Severe irritation of the nerves of the peritoneum or mesentery*, e g consequent on the perforation of a gastric ulcer or of a gangrenous appendix, or torsion of an ovarian cyst pedicle
2 *Obstruction of an involuntary muscular tube* whether it be the biliary duct, the ureter, the uterine canal, or the intestine
3 The action of absorbed toxins upon the medullary centres

1 It needs little imagination to picture the intensity of stimulation of the nerve endings in the peritoneum by the acid gastric juice flowing freely into the peritoneal cavity, nor is it surprising that a patient should vomit very soon after the onset of such irritation But the rapid and copious pouring out of diluting fluid from the irritated *peritoneal surface soon dilutes the acid gastric juice and lessens the* irritation, so that vomiting is seldom persistent after the perforation of a peptic ulcer

In acute pancreatitis the cœliac plexus is so intimately associated with the inflamed organ that the reflex stimulus is very great and vomiting is therefore very severe It is frequently persistent, since there is no mitigation of the severe stimulus apart from operation or gangrene of the organ

Strangulation of a coil of intestine and torsion of the pedicle of an ovarian cyst are examples of sudden catastrophes in which sudden and severe stimulation of many sympathetic nerves causes vomiting to occur early and to be persistent

2 Stretching of involuntary muscles causes pain and if the stretching be extreme, vomiting occurs Obstruction of any of the muscular tubes causes peristaltic contraction and consequent stretching of the *muscle wall and vomiting is therefore common* with such obstruction This is well seen in all the colics, biliary, renal intestinal and uterine Behind the obstruction the tube becomes somewhat dilated and as each peristaltic wave passes along the tension and stretching of the muscular fibres are temporarily increased so that the pain of colic comes usually in spasms Vomiting usually occurs at the height of the pain

In intestinal obstruction there is the additional factor that the contents of the intestine are mechanically prevented from progressing onward and a reversed current may be set up, possibly as the result of antiperistalsis The contents of the intestine, sometimes as far down as the site of obstruction are therefore vomited

3 It is well known that the stimulation of a particular nervous centre in the medulla oblongata by certain drugs—as for example apomorphine—may cause vomiting It is likely that in intestinal obstruction the vomiting may be partly due to the effect of toxins,

absorbed from the contents of the intestine, upon the medullary centre

THE RELATIONSHIP OF PAIN TO VOMITING —It is important always to inquire the exact time of vomiting relative to the onset of pain In sudden and severe stimulation of the peritoneum or mesentery vomiting is early, coming on soon after the pain In acute obstruction of the ureter by a stone, or of the bile duct by a calculus, vomiting is early sudden, and violent In intestinal obstruction the length of interval before vomiting ensues gives some indication as to how high in the gut the obstruction is situated If the duodenum has become obstructed by a gall stone vomiting comes on almost as soon as the pain, and is for a time and until the stone passes on frequent and violent If the lower end of the ileum be constricted (apart from strangulation which leads to early vomiting) the vomiting may not occur for four or more hours according to the acuteness of the stoppage In large bowel obstruction the vomiting is usually quite a late feature and sometimes may not occur at all though nausea is often present at a much earlier stage

In appendicitis pain almost always precedes the vomiting usually by three or four hours, ometimes by twelve or twenty four hours or even longer Rarely indeed does the vomiting occur simultaneously with the onset of pain and very rarely indeed does the pain start after the vomiting

THE FREQUENCY OF THE VOMITING —This usually varies directly as the acuteness of the condition Frequent vomiting *at the onset* of an attack of acute appendicitis usually means that the appendix is distended on the distal side of a stricture or concretion, and signals the immediate danger of perforation Frequent vomiting later in the course of an appendicitis usually means extension of peritonitis

There are however many serious abdominal conditions in which vomiting is either infrequent, slight or absent Internal hæmorrhage from a ruptured ectopic gestation is often accompanied by little or no vomiting After the initial shock due to perforation of a gastric or duodenal ulcer there is often a latent period before symptoms of peritonitis assert themselves During this period vomiting may not occur and there may be no complaint of nausea

In obstruction of the large intestine vomiting is a late or infrequent symptom This is very noticeable in cases of intussusception, where the absence of vomiting may deceive as to the acuteness and danger of the condition When vomiting occurs in undoubted obstruction of the large intestine it is generally due to the inadequacy of the ileo cæcal valve allowing the back pressure to distend the lower ileum

In obstruction high up in the small intestine vomiting is frequent and copious in quantity

THE CHARACTER OF THE VOMIT —This needs to be noted In acute gastritis, which in severe cases may give rise to alarming abdominal symptoms, the vomit consists of the contents of the stomach possibly mixed with a little bile In the colics the vomit is commonly bilious In cases of severe sympathetic shock, such as occurs with acute torsion of a viscus, it is common for the patient to retch frequently but vomit very little *An infant with duodenal atresia will vomit bilious fluid, but* the vomit in the case of congenital hypertrophic pyloric stenosis will not contain any bile

In intestinal obstruction the character of the vomited material varies First the gastric contents, then bilious material then greenish yellow yellow, and finally brown fæculent smelling fluid is ejected Fæculent vomit is pathognomonic of obstruction of the intestine—either mechanical or paralytic

NAUSEA AND LOSS OF APPETITE —These may be induced in many people who do not vomit In some patients it appears to need a greater stimulus to produce vomiting than in others In the same person different grades of the same kind of stimulus may produce anorexia, nausea, or vomiting Therefore it is always important to inquire for the two former as well as the latter *Acute* loss of appetite is always significant In a child, especially a sudden distaste for food accompanied by abdominal pain should always cause one to make a *very careful examination for appendicitis In questioning* a child it is well to find out the last meal that the child really enjoyed and the first for which it had no eagerness

BOWELS

It is of course, important to investigate the condition of the bowels but it is unwise to attach too much importance to the simple fact of constipation unless accompanied by other symptoms What is of greater importance is any significant departure from previously normal action of the bowel In a person who is accustomed to a regular action *of the bowels every day, the occurrence* of constipation for several days may be of serious import especially if accompanied by abdominal pain or flatulence

The passage of several small loose motions amounting almost to diarrhœa is common at the onset of many cases of appendicitis in children *When hypogastric pain and diarrhœa are followed by hypogastric tenderness and constipation, suspect a pelvic abscess* Tenesmus is sometimes a complaint in cases of pelvic abscess

The presence of obvious blood or slime in the motions is to be asked after and looked for The significance of blood and mucus in the rectum in the diagnosis of intussusception is well known

MENSTRUATION

Since pregnancy and the derangements thereof play so large a part in the health and disease of women it is essential to inquire into the regularity of menstruation It is not sufficient to ask whether the periods are regular the exact date of the last period must be ascertained and any irregularity noted Antedating or postdating of the normal period by a few days or a longer or more profuse loss or the reverse must be noted Many patients with tubal gestation take the uterine loss which occurs at the time of threatening tubal abortion or rupture as the normal menstrual loss if the hæmorrhage happens to coincide with the time of the usual monthly period In such cases, however it is nearly always possible by careful questioning to ascertain that the loss is in some way abnormal

Pain accompanying the period of a woman who is not usually subject to dysmenorrhœa should make one think of threatening early abortion tubal gestation or some condition unassociated with pregnancy

PAST HISTORY

It is well to inquire concerning any previous illness e g typhoid fever peritonitis appendicitis or pneumonia which may possibly have a bearing on the present illness

Since many if not most abdominal pains are loosely termed indigestion inquiry should be directed as to the occurrence of any pain which has any relationship to the taking of food Pain which comes on two or two and a half hours after food would suggest duodenal ulcer Constant epigastric pain made worse by the taking of food would make one suspicious of carcinoma or chronic ulcer of the stomach Epigastric or right hypochondriac pain irregularly related to meals is in keeping with the presence of gall stones

Previous attacks of jaundice melæna hæmatemesis and hæmaturia must briefly be inquired after and it is well to find out if any great and known loss of weight has occurred

Previous residence in tropical climes and any dysenteric history should be ascertained

In a woman previous confinements or pregnancies should be noted

III

METHOD OF DIAGNOSIS

2 THE EXAMINATION OF THE PATIENT

THE GENERAL APPEARANCE

THE FACIAL expression of the patient will on occasion furnish valuable evidence of the serious nature of the pain of which he complains The pale or livid face with sweating brow of a patient suffering from the *initial shock of a perforated gastric ulcer, acute pancreatitis or acute* strangulation of gut is sufficiently distinctive, whilst the deathly pallor and gasping respiration of a woman with internal hæmorrhage from rupture of a tubal gestation leave little doubt as to the diagnosis But appearances are often deceptive, and in connexion with acute abdominal disease it is important ever to keep in mind the reaction from initial shock which commonly occurs and renders latent even the most serious internal conditions Most surgeons of experience have seen patients suffering from perforation of a gastric ulcer who gave no indication from complexion or facial expression of the *serious intra* abdominal condition from which they were suffering The so called abdominal facies is not infrequently absent in an abdominal case In the majority of cases of early appendicitis the facial appearance of the patient does not help at all But in the late stages of all varieties of acute abdominal disease the face tells the observer much that he ought to know but is sorry to learn The dull gaze of the eyes and the ashen countenance of one suffering from severe toxæmia or the sunken cheeks and hollow eyed aspect of the patient who has been *vomiting repeatedly from internal obstruction or advanced peritonitis* can always be recognized by the skilled clinician

The back of the observer s hand placed on the patient's nose and cheek will often determine whether shock is present or collapse im pending for a cold nose and cheek due to failing capillary circulation are usually indicative of one or the other

If the alæ nasi are observed to be moving, the attention should always be particularly directed to the thorax for a high temperature with moving alæ nasi generally means pneumonia It must be remem *bered, however that any abdominal condition* which in any way impedes the movement of the diaphragm may be accompanied by movement of the alæ

THE ATTITUDE IN BED

The attitude in bed is noteworthy The restlessness of those suffering from severe colic or from intra peritoneal hæmorrhage contrasts with the immobility and dislike of movement evinced by the majority of those suffering from peritonitis Ask a patient suffering from a per forated gastric ulcer to turn on to his side and one sees at once the difficulty, circumspection, and pain with which the movement is accomplished With extensive peritonitis the knees are frequently drawn up to relax the abdominal tension, whilst any inflammatory condition in contact with the psoas muscle causes a flexion of the corresponding thigh

In the early stages of many pathological states of the ab domen however no great help is obtainable from observing the attitude

THE PULSE

The pulse is too optimistic a friend to be relied upon for guidance either in diagnosis or prognosis in the early stages of acute abdominal disease Exception must be made of the weak rapid pul e of the initial shock stage of many of the abdominal catastrophes but one can prove the unreliability of the pulse as a general guide by stating what every operator of experience knows i e that the pulse *may* be regular in force and normal in frequency, even though there be an acutely inflamed appendix or a ruptured intestine or an obstructed coil of gut or even (rarely) an acutely inflamed pancreas causing the ab dominal pain A normal pulse does not necessarily indicate a normal condition of the abdomen

On the other hand, an increase in frequency of the pulse is a con stant accompaniment of the more advanced stages of peritonitis and hæmorrhage and after abdominal injury the careful observance of the pulse hour by hour is of great value in estimating the nature or serious ness of the intra abdominal trouble In advancing *peritonitis also* there is frequently a slight irregularity in force and an occasional intermittence of the pulse which may be significant

The pulse of late peritonitis—small hard rapid so as to be almost uncountable—is usually a terminal event *and is always of bad prog nostic* significance

If acute abdominal disease is to be diagnosed in the early stages it must first be realized by the practitioner, who will see *the case at the* beginning that many if not most patients with serious acute lesions of the abdomen have a normal pulse for a considerable time during the early stage

THE RESPIRATION RATE

This is chiefly of importance in differentiating between an abdominal and a thoracic condition If the respiration rate be raised to double the normal at the inception of the illness, the causative lesion is probably thoracic in origin In general peritonitis, however, or in cases of intestinal obstruction with great distension, or in severe intra abdominal hæmorrhage, the breathing may be much more hurried than usual, and with some persons nervousness produces shallow and more rapid respiration The pulse respiration ratio is of greater value in diagnosis

TEMPERATURE

A sub normal, normal, or raised temperature may accompany acute abdominal disease All three may be recorded in the same case at different times In any severe abdominal shock or in severe toxæmia the thermometer frequently registers as low as 95° F or 96° F This is the temperature, for example, often recorded at the onset of an attack caused by acute pancreatitis, acute intestinal strangulation perforated gastric ulcer, or severe intra peritoneal hæmorrhage

At the onset of an attack of acute appendicitis the temperature is usually normal, but within a few hours it generally rises steadily to about 100 F or 101° F When perforation occurs the temperature usually goes a little higher, but sometimes the sudden absorption of depressing toxins may bring the temperature down to normal or even sub normal

A normal temperature is often seen in the reaction stage of a perforated gastric ulcer

The reaction stage of a ruptured ectopic gestation is usually accompanied by irregular but not high fever

In intestinal obstruction the temperature is, as a rule, normal or sub normal If any patient with abdominal pain is found to have a temperature of 104 or 105° F at the onset of the illness the thorax or the kidney is very likely the seat of the disease High fever is quite unusual during the early stages of acute abdominal disease

TONGUE

Though usual it is by no means invariable to find the tongue furred in acute abdominal conditions In acute appendicitis and acute intestinal obstruction there is usually a slight coat on the tongue and the breath is frequently foul Nevertheless many patients with an undoubtedly inflamed appendix may present a clean tongue

The *appearance of the tongue* is a valuable guide in cases of uræmia which may simulate intestinal obstruction In renal failure the tongue

is very dry and heavily covered with a brownish fur, whilst there is a tendency for sordes to collect on the teeth

ABDOMINAL EXAMINATION

Before examining the abdomen it is well to learn from the patient the exact place where the pain started and if there has been any alteration in its location The exact point of maximal pain should also be pointed out at the time of examination

Inspection of the abdomen will reveal at a glance any abnormal local or general distension, and will in some cases determine the presence of a tumour or abdominal swelling *All the hernial orifices must be inspected as a routine and special attention directed to the femoral canal where in a fat subject a small hernia is not difficult to overlook*

Movement on Respiration

The respiratory movement of the abdominal wall is carefully to be noted for any limitation indicates some rigidity of the diaphragm or abdominal muscles or possibly undue distension In the case of a perforated ulcer which has ruptured into the general peritoneal cavity the abdominal wall hardly moves in any part on respiration whilst in appendicitis the hypogastric zone especially the right iliac area will very frequently be seen immobile In acute pancreatitis the epigastric zone may be motionless and sometimes also the lower part of the abdominal wall With biliary colic there is sometimes inhibition of the diaphragm so that the respiratory movement of the epigastric area of the abdominal wall is diminished

In performing palpation of the abdomen it is hardly necessary to remind the reader that the hands should be warm that the examination should be commenced by the hand at that part of the abdomen farthest removed from the point of maximum tenderness and that gentle pressure should be made by the soft pulp of the fingers Palpation determines the extent and intensity of the muscular defence or rigidity locates any tender areas or hyperæsthetic patches and determines the presence of any swelling It is well to have the patient s thighs flexed while palpating the abdomen

Rigidity

Muscular rigidity is a relative term The contraction of the muscles may be firm continuous and like a board as in many cases of general peritonitis due to perforated ulcer or the muscular fibres may not contract to any detectable extent till the fingers are gently pres ed on the abdominal wall when the muscles spring to attention to defend

the subjacent inflamed parts There is also an important mental factor in the production of abdominal wall rigidity In some sensitive children, and in some very apprehensive adolescents and adults, the abdominal wall is held very rigid even though there be very slight intra abdominal cause for it

In pelvic inflammatory lesions rigidity is often absent In intestinal obstruction the muscles are not usually held rigid In rigidity due to thoracic disease, if the muscle contraction be overcome by continuous pressure the abdominal pain is not usually increased, but if there be a subjacent inflamed area in the abdomen the pain becomes greater as the hand presses in and overcomes the muscular resistance Some apprehensive patients have difficulty in relaxing their abdominal muscles but prefer to make use of costal breathing even when there is no sufficient cause for abdominal rigidity Nicholson has suggested a simple way of encouraging them to use their abdominal muscles A pillow is placed under the knees of the patient, and if need be the chest may be supported by pillows When about to palpate the abdomen with the right hand, the observer rests his left hand with a fair amount of pressure on the sternum of the patient thereby inducing him to use the diaphragm and abdominal muscles unless there be a serious lesion to prevent this

It is exceedingly important to remember that muscular rigidity and resistance may be very slight even in the presence of serious peritonitis (1) when the abdominal wall is very fat and flabby, and the muscles thin and weak, (2) when the patient is suffering from severe toxæmia and the reflexes are dulled and diminished as the result of the absorbed toxins It is noteworthy that the recti are usually more definitely rigid than the lateral abdominal muscles

Hyperœsthesia

Hyperæsthesia may be tested by pin stroke or by light pinch For routine use the testing by lightly stroking with the point of a pin is the best method to adopt Care is taken to hold the pin at an acute angle to the skin so that it does not scratch The abdominal skin is then stroked from above downwards in several vertical lines first on the right side then on the left The patient is told to say at once if the pin stroke feels sharper at any place It is wise also to test the loin and posterior lumbar region in the same way Hyperæsthesia may be detected (*a*) in the segmental distribution of that part of the spinal cord from which the affected viscus is innervated (*b*) along the distribution of those peripheral nerves some of whose terminals are irritated by the inflammatory process It will be found that cutaneous hyperæsthesia is present in half the number of acute abdominal

conditions which present themselves for diagnosis Hyperæsthesia nearly always indicates visceral or parietal peritoneal inflammation It is not common to obtain hyperæsthesia in the upper abdomen Most commonly the hypersensitive area lies below the umbilicus and varies from an iliac triangle on one or both sides to a small patch somewhere within the limits of the triangle Occasionally a complete band stretches right back to the spine

Though appendicitis is by far the most common abdominal disease which gives rise to hyperæsthesia in the lower part of the abdominal wall yet cholecystitis perforated duodenal ulcer pyelitis, and various kinds of peritonitis may also cause cutaneous hypersensitiveness in the area above Poupart's ligament It is however, comparatively rare to find an iliac triangle of hyperæsthesia in any condition other than appendicitis Hyperæsthesia is helpful when detected but it is by no means a constant accompaniment of early disease whilst in severely toxic cases it may also be absent

Unimanual and bimanual palpation of the loins

This is of help in detecting renal or other loin swellings

The finger tips of one or other hand are pressed forward under the

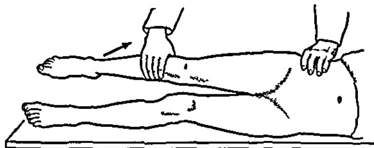


FIG 5.—Diagram to demonstrate method of performing the ilio psoas test

ribs of the corresponding side of the patient s body Resistance and tenderness without swelling indicate rigidity and sensitiveness of the quadratus lumborum and adjacent muscles due probably to a tender inflammatory focus near by A perinephric abscess an inflamed kidney, or a retrocæcal inflamed appendix may give this sign

In bimanual palpation the observer brings the other hand to the front of the loin, and can thus feel between the two hands any loin swelling A pyo or hydro nephrosis or a lumbar abscess can thus be detected The patient should be asked to take a deep breath so that any movement of the swelling can be ascertained

Determination of the psoas rigidity

It is well known that if there be an inflamed focus in relation to the psoas muscle the corresponding thigh is often flexed by the patient to relieve the pain A lesser degree of such contraction (and irritation) can be determined often by making the patient lie on the opposite side and *extending the thigh on the affected side to the full extent* Pain will be caused by the manœuvre if the psoas be rigid from either reflex or direct irritation (Fig 5) The value of the test is diminished if the anterior abdominal wall be rigid The psoas test is not so easily elicited when the inflammation becomes subacute

Liver dullness

The estimation of liver dullness is occasionally of value The dullness due to the liver is usually obtainable in the right vertical nipple line from the fifth rib to below the costal margin and from the seventh to the eleventh rib in the mid axillary line If in a patient who has no signs or symptoms of an atrophic liver, and in whom there is no abdominal distension a resonant note be obtained on percussing in the normally dull area in front, or if in any case a *resonant note be obtained* in the normally dull liver area in the axillary line then there *must be free gas in the peritoneal cavity* due to the rupture of stomach or intestine (The rare condition of pyo pneumo subphrenic abscess is usually a late result of a ruptured stomach)

The determination of liver dullness anteriorly is of no value in cases of great distension for intestine may be pushed up in front of the liver and cause resonance higher than normal

Free fluid

The determination of the existence of free fluid in the abdominal cavity by the proving of movable dullness is not of such great importance in diagnosing acute abdominal disease There are very few acute abdominal *conditions in which there is not some free* fluid and in those cases where there is an easily estimable amount of fluid there are usually other signs and symptoms which suffice In the writer s experience it has *seldom been necessary and often inadvisable* to attempt to determine it Free fluid in the abdomen may be serum sero pus, pus or blood If there be enough blood in the peritoneal cavity to cause movable dullness it is unwise to move the patient about and hæmorrhage *should be evident from other symptoms* In peritonitis with pouring out of a great deal of fluid it causes pain to *move the patient and the test is usually unnecessary*

In intestinal obstruction the determination of free fluid is of some

It is important to test for tenderness on pressure against the pelvic peritoneum (See Fig 12, p 43)

Bulging of a pelvic abscess against the anterior rectal wall can readily be detected

Laterally—Tenderness due to an inflamed swollen appendix or a mall abscess on the lateral wall of the pelvis can be elicited

Posteriorly—Palpation will determine any tumour or inflammatory ass on the pyriformis, or in the hollow of the sacrum

When the finger is withdrawn the presence on it of blood, slime, or s should be noted

n estimating the amount of pain caused by pressure upward on the

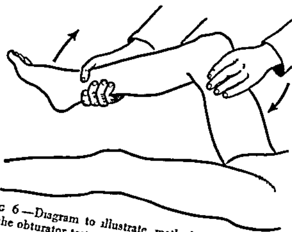


Fig 6—Diagram to illustrate method of performing the obturator test

pelvic peritoneum one must not be misled by the patient's expression of general discomfort, but must ascertain that the pain is due to pressure of the finger tip

Bimanual recto abdominal or vagino abdominal examination will determine the presence and position of any pelvic tumour or swelling It is specially important to note the size and position of the uterus Any fullness in Douglas' pouch should be carefully palpated

In infants a bimanual recto abdominal examination enables one to explore the lower part of the abdominal cavity thoroughly and it may be possible to manipulate an intussusception between the fingers of the two hands

Thigh rotation test

When there is any inflamed mass adherent to the fascia over the obturator internus muscle, rotation of the flexed thigh, so as to put

the irritated muscle through its full movements (especially internal rotation), will cause hypogastric pain This sign should be tried especially when rectal examination is difficult or for any reason inadvisable (Fig 6) The sign is positive when a perforated appendix, a local abscess, and occasionally when a hæmatocele is in contact with the obturator internus, or when there is an accumulation of inflammatory fluid in the pelvis

EXAMINATION OF THE CHEST

The chest should be thoroughly examined by the usual methods of inspection, palpation percussion and especially auscultation By this means diaphragmatic pleurisy early pneumonia and pleural effusion will be detected The cardiac dullness must also be determined and the cardiac sounds auscultated

SPINE

Any rigidity of or pain over the spinal column should be carefully observed especially in children in whom abdominal pain is frequently complained of during the course of spinal caries

KNEE JERKS AND PUPILS

In an adult no examination of a patient suffering acute abdominal pain is complete without a testing of the knee jerks and the pupil reactions If the pupils or even one pupil do not react to light or if one or both knee jerks are absent search must be made for other signs of *tabes* so as to determine whether the pain is due to a visceral crisis Remember, however that acute abdominal disease may exist in a tabetic subject

URINE

The importance of examination of the urine is well known and constantly taught but though the precept be acknowledged the practice is often at fault The presence of blood pus albumin, sugar and bacteria should be ascertained Not only is great light often thus thrown upon the diagnosis but the finding of one or the other may qualify prognosis and alter treatment Before operating on and as a help in the diagnosis of acute abdominal disease it is sometimes wise to pass a catheter to ensure that the bladder is empty

BLOOD PRESSURE

The estimation of the blood pressure is often of assistance in

diagnosis of acute abdominal crises It is chiefly in cases of internal hæmorrhage, shock, and circulatory failure following intestinal obstruction that a knowledge of the exact state of the blood pressure is valuable Both the systolic and the diastolic pressures need to be taken, for the most important figure to be known is the difference between the two, i e the pulse pressure which indicates the reserve power in the circulation A low pulse pressure is only found in the most serious states of collapse

X RAY EXAMINATION

With the increase in facilities for X ray examination there is usually little difficulty in obtaining a radiograph of the abdomen in cases which may require it Much information may be obtained in cases of intestinal obstruction Local distension of coils of intestine in an otherwise undistended abdomen may point to small bowel obstruction, fluid levels may definitely demonstrate a stoppage in the small intestine, and frequently the outline of a distended colon will show the surgeon the exact site of the obstruction The diagnosis of volvulus of the cæcum may be suggested or confirmed by seeing the shadow of the distended cæcum higher than normal, i e in the right hypochondrium or epigastrium Most important of all in a case of suspected intussusception a radiograph taken after the administration of a barium enema will make the diagnosis certain (Plate 7)

AUSCULTATION

Auscultation of the abdomen is occasionally of use in determining whether the normal sounds due to intestinal movements are to be heard If no sounds due to movement are heard it follows that the intestines are in a state of paralysis due to ileus or peritonitis Sometimes the nature of the sounds may help one to conclude that gas is being forced through an obstructed bowel Occasionally friction sounds consequent on peritonitis may be heard It is relevant here to remark that auscultation of the abdomen was found by Blackburn and Rob to be of the greatest assistance in determining whether or not a gun shot wound of the abdomen had caused injury to the intestine they found that in the presence of sounds due to intestinal movement it was very rare to find any injury to the intestine They pointed out that the auscultation may have to be repeated several times at intervals before making up one's mind that movements are absent and came to the important conclusion that peristalsis is only absent when the activity of the whole intestine has been inhibited by a general peritoneal soiling" (*Brit J Surg* 1945 **33** 46)

MEASUREMENT

Measurement of the abdomen has been used by some surgeons to give information as to the progress of a pathological lesion particularly as to increase of distension The tape must of course be placed round the abdomen at the same level each time for the comparison to be of value The author has not made use of this help, but agrees that it may be of assistance, especially when X rays may not be available

IV

METHOD OF DIAGNOSIS

3 *THE GROUPING OF SYMPTOMS*

IN THE two preceding chapters the methods of examination have been described The next step is to piece the facts together in an approach to diagnosis All abdominal crises give rise to one or more of five main symptoms—pain, collapse vomiting muscular rigidity, or abdominal distension Most serious lesions present two or more of these main symptoms, but sometimes pain may be the sole symptom It may be of assistance, therefore to consider the various symptom groups and the likely or possible causes of each group The severity and the order of occurrence of the symptoms are important, and there are many other points—e g fever, diarrhœa, constipation hyperalgesia—which will be of help in differentiation

What, then, are the main clinical pictures which may present themselves to the surgeon?

The *first is*

ABDOMINAL PAIN BY ITSELF

A warning should be given here Diagnosis would be so much simpler if pain and tenderness were always felt immediately over the site of disease, but such is not always the case The initial pain of appendicitis is felt in the epigastric or umbilical regions while obstructive pain arising from the transverse colon (which is commonly situated in the epigastrium) is usually felt in the lower part of the *abdomen (Fig 7)*

Abdominal pain is the only symptom in the earliest stage of quite a number of serious conditions If the pain is felt only on one side of the abdomen and if it radiates down to the corresponding groin or testicle, one must suspect renal colic and watch for blood in the urine If the pain is felt all round the epigastric zone but seems greatest in the right hypochondrium and goes through to the subscapular region suspect biliary colic

CENTRAL ABDOMINAL PAIN

Suppose the only symptom is severe central abdominal pain What conditions must you bear in mind?

Severe epigastric or central abdominal pain may be due to simple

intestinal colic, to the earliest stage of acute appendicitis, to the initial stage of obstruction of the small intestine, to acute pancreatitis, or even the onset of mesenteric thrombosis (Let it not be forgotten

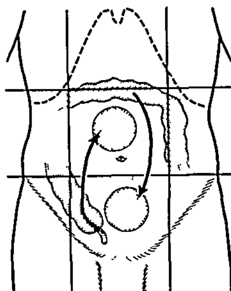


FIG 7

that the small gut obstruction may arise in a small and almost invisible femoral hernia.) In addition to these intra abdominal causes the observer must remember that certain extra abdominal conditions may cause deceptive pain within the abdomen, thus tabes dorsalis herpes zoster coronary thrombosis and even acute glaucoma may temporarily mislead the practitioner (Fig 8)

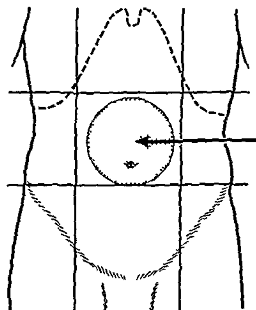
The golden rule in these cases is to examine the patient again within two or three hours In nearly every serious case there will by that time be some other symptoms such as vomiting fever, or local tenderness which may point more definitely to the nature of the lesion

In the case of appendicitis after a few hours there will be nausea or vomiting followed by right iliac tenderness and slight fever With a pelvic appendix however right iliac pain may be longer in appear ing but a *rectal examination* will reveal local tenderness

Simple gastric or intestinal colic due to some indigestible article of diet or to incipient bacterial infection, is usually relieved by pressure,

accompanied by audible gurgling, and is made evident by the shifting of the pain to the lower abdomen as the irritating factor reaches the large bowel If the pain persists without any of these tell tale consequences, suspect something more serious, for it is very common for patients with any kind of abdominal pain to attribute it to some recently ingested article of diet

Tabes dorsalis may be excluded by testing the knee-jerks and noting whether the pupils react normally to light and accommodation. With herpes there will soon appear the characteristic rash sometimes



Acute central abdominal pain without any other symptom FIG. 8.

preceded by a zone of hyperalgesia and with this condition there will be no nausea or vomiting

The abdominal pain which sometimes accompanies acute glaucoma may distract both the patient s and the doctor s attention away from the real source of the trouble If this possibility be remembered, the mistake is soon remedied

Another combination of symptoms is

SEVERE CENTRAL PAIN WITH SEVERE SHOCK

When severe pain is accompanied by collapse, pallor, subnormal temperature and lowered blood pressure yet without abdominal rigidity the cause is more likely to be due to acute pancreatitis

mesenteric thrombosis, internal hæmorrhage, dissecting aneurysm, or even coronary thrombosis, and in women ectopic gestation

Acute pancreatitis starts with severe epigastric pain and collapse, but pain is also felt deep in each loin There may be some retching and at a later stage some epigastric rigidity As the attack advances irritative inflammatory fluid finds its way into the lower abdomen, particularly on the right side so that the condition may be mis diagnosed as appendicitis A history of previous attacks of biliary colic may put one on the right track but one may be in doubt until a later stage when the serum amylase may be found greatly increased or Grey Turner s sign be evident (discoloration in the loins)

Dissecting aneurysm starts with thoracic pain which sometimes radiates down the left arm, and pain in the abdomen follows a little later and may lead to obliteration of one or both femoral pulses

The early stage of *mesenteric thrombosis* may be very difficult to diagnose but a previous history of intermittent claudication or other symptom of serious arterial disease may give an indication of the true state of affairs

Coronary thrombosis which often causes severe epigastric pain and may lead to real difficulty in differentiation from an intra abdominal lesion is usually accompanied by a greater fall in blood pressure than is usual in abdominal lesions

The pain and acute collapse from a severe hæmorrhage into the peritoneal cavity (as may result from a ruptured aneurysm or a spontaneous rupture of the spleen in a man, or from the sudden rupture of an ectopic gestation in a woman) soon leads to an obvious anæmia which is accompanied by tumidity of the abdomen These conditions are described elsewhere in this book P 138-157

PAIN WITH VOMITING AND INCREASING DISTENSION BUT NO RIGIDITY

This group usually means intestinal obstruction A single initial vomit is common to nearly all urgent conditions within the abdomen but repeated and persistent vomiting is indicative of obstruction of the small bowel or of spreading peritonitis but in the latter case there is abdominal rigidity With both conditions distension develops, but it comes on more quickly with peritonitis

It is true that severe central pain and repeated vomiting without distension may be due to an acute gastritis though before that diag nosis can be accepted more serious lesions must be definitely excluded Above all one must exclude obstruction of the upper part of the small bowel All the hernial orifices must be carefully examined particularly the femoral rings The abdominal wall must be examined

for scars of former operations, and the vomit must be inspected to note any change of colour from the bilious green to the dirty yellow which is the prelude to the stinking fæculent vomit of advanced obstruction of the small gut

If the vomiting is not very frequent and distension of the ladder pattern gradually develops, one must expect the obstruction to be in the lower ileum Visible peristalsis would, of course clinch the diagnosis In any case of doubt, make another visit to the patient within an hour or two, and if possible have a plain X ray film of the abdomen made to see if there are any fluid levels in the small bowel or any significant distension of a coil of small intestine

ABDOMINAL PAIN WITH CONSTIPATION, LITTLE OR NO VOMITING, BUT INCREASING DISTENSION

Abdominal pain, accompanied by constipation and steadily increasing distension but little or no vomiting, is likely to be due to obstruction of the large bowel, particularly of the sigmoid colon In a patient who has had severe abdominal pain constipation, and *increasing distension if vomiting begins and becomes more frequent* then one should suspect obstruction of the large bowel with sudden failure of the ileo cæcal valve with resulting back pressure into the *lower ileum leading to symptoms of obstruction of the small bowel* A plain X ray of the abdomen will give valuable information in these cases

If abdominal distension of large bowel type develops rather quickly in an elderly patient, one must suspect a volvulus of the sigmoid colon Sometimes a rectal examination may enable one to feel the thickened base of the twisted coil, and if an X ray film can be taken, one would be able to see the distended coil quite clearly

Before any operation for intestinal obstruction is undertaken, it should be the rule to examine the urine for albumin, and to palpate the renal regions for any tumour Uræmia from any cause may lead to great abdominal distension and vomiting Uræmic distension may follow renal failure as a result of back pressure from an enlarged prostate, from bilateral polycystic disease of the kidneys or from bilateral calculous pyonephrosis On one occasion I have known the abdomen explored for supposed intestinal obstruction when the real cause of the distension and vomiting was renal failure due to lead poisoning caused by the swallowing of diachylon plaster with the intent of inducing abortion

Vomiting and distension in a newborn infant may be due to congenital obstruction of the small bowel The diagnosis may be confirmed by an X ray which will show fluid levels in the small intestine

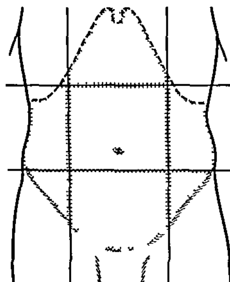
In children one form of obstruction and one type of peritonitis (pneumococcal) need to be specially mentioned

In infants of from six to eighteen months intussusception is fairly *common It occurs most often in healthy male infants* The symptoms commence suddenly the infant screams, looks pale and ill and draws up his legs The pain subsides the child seems better and may go to sleep, only to be awakened again by the recurrence of the pain which causes another screaming attack After several attacks of pain, examination may reveal a sausage shaped swelling in the epigastrium or left side of the abdomen Blood or mucus may be passed per anum or be seen on the finger following a rectal examination A barium enema will clearly demonstrate an intussusception (Pneumococcal peritonitis in children is discussed in Chapter XX)

A well recognized group of symptoms is that of

SEVERE ABDOMINAL PAIN WITH COLLAPSE AND GENERAL RIGIDITY OF THE ABDOMINAL WALL

When a patient is found to be suffering from the above group of symptoms the cause of the trouble is nearly always a visceral per



Severe abdominal pain with collapse and general rigidity of abdominal wall

FIG 9

foration usually of the stomach or duodenum consequent on the erosion of a peptic ulcer Less common causes of general rigidity are

perforation of the gall bladder or of a stercoral ulcer of the colon, and occasionally the rupture of a very distended appendix may quickly cause general rigidity and some collapse

Of extra abdominal conditions, bilateral pleuro pneumonia may sometimes cause severe abdominal pain and rigidity, but if the rigidity can be overcome there will be no deep tenderness, and examination of the chest should reveal disease in that quarter

With the gastric crisis of tabes, there is no rigidity of the abdominal wall unless there is associated peritonitis It should not be forgotten that perforation of a gastric or duodenal ulcer *may* occur in a patient suffering from tabes dorsalis

The symptoms of a perforated peptic ulcer are well known and characteristic Severe general abdominal pain often accompanied by initial collapse and always associated with a board like rigidity of the abdominal wall, is followed in an hour or two by a reactionary stage in which the patient looks and feels better but the abdominal rigidity remains This leads up to the final stage when peritonitis develops, the pulse rate increases and vomiting and distension become prominent There is often pain felt on top of the shoulder and the liver dullness may be diminished If X rays are available, air may be shown between the liver and the diaphragm (See Chapter VII and Plate 4)

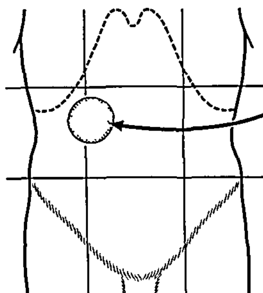
The group of symptoms which is perhaps most common and often the most difficult to diagnose is that in which pain, tenderness, and muscular rigidity are localized to one or other part of the abdomen In most cases the diagnosis depends upon a careful discrimination between several possible causes The various regions can only be considered briefly here

Right hypochondriac pain and rigidity

If the chest be clear these symptoms are usually due either to an acute cholecystitis or to a leaking duodenal ulcer (The differential diagnosis is more fully considered in Chapter XV) It is sometimes exceedingly difficult to differentiate between these two conditions before exploration In tropical climes amœbic hepatitis may cause similar symptoms and in regions where hydatid disease of the liver is common inflammation of such a diseased liver must be considered

Left hypochrondriac pain and rigidity

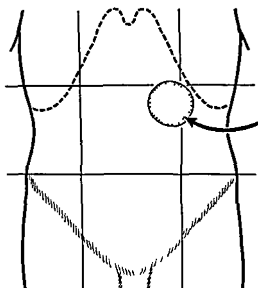
The left upper quadrant of the abdomen is least often the site of origin of local peritonitis, and all the causes must be accounted rare One should consider the perforation of a gastric ulcer localized by adhesions the rupture of an inflamed jejunal diverticulum, the leakage of an aneurysm of the splenic artery and the spontaneous rupture of the spleen



Leaking duodenal ulcer Acute cholecystitis *Appendicitis with high* appendix Pleurisy

Tenderness and rigidity in right hypochondrium

Fig 10



Perforated gastric ulcer (subphrenic abscess) Jejunal diverticulitis Rupture of spleen (spontaneous) Leaking aneurysm of splenic artery

Tenderness and rigidity in left upper quadrant

Fig 11

In the last two conditions there will be evidence of hæmorrhage, microscopical examination of a stained blood film might show evidence of leukæmia The history may be suggestive of gastric ulcer or of jejunal diverticulitis, to which attention has been more often called during the past decade

JEJUNAL DIVERTICULITIS

During the past two decades many observations have been made on patients suffering from acute abdominal symptoms due to inflammation in one or more jejunal diverticula When these diverticula are not inflamed there may be no acute symptoms, but the patient often complains of epigastric pain radiating down the left side of the abdomen, and coming on at a varying time after the taking of food At a later stage the pain may become more constant According to Ian Fraser, however, the most constant feature of the disease is the flatulence, borborygmi, gurgling and rumbling that all these patients suffer from"

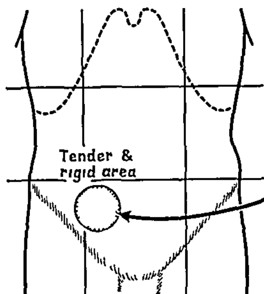
When acute abdominal symptoms supervene in a patient who gives the characteristic history, it is usually due to inflammation or rupture of a diverticulum Pain in the upper and left side of the abdomen, vomiting, local rigidity, and tenderness would be the indications of a local peritonitis If the leakage is gradual and a local abscess forms one may feel a mass, and sometimes a partial obstruction of the small bowel may result If as sometimes may happen, the symptoms are more noticeable on the right side of the abdomen, the simulation of appendicitis may be almost complete

Right iliac pain tenderness and rigidity

The most common cause of these symptoms is, of course, acute appendicitis, but there are many pitfalls which are considered more fully in Chapter V Suffice to say here that a similar group of symptoms *may* result from disease of the pancreas, gall bladder, duodenum right kidney, the ileo cæcal glands, a Meckel s diverticulum, the end of the ileum (ileitis) a retained testis (in the male) and the right Fallopian tube and ovary (in the female) For differential diagnosis see page 59

Left iliac pain and rigidity

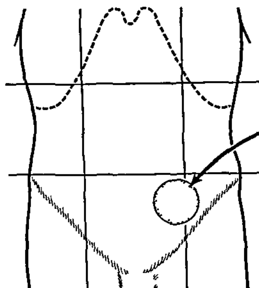
This combination of symptoms is also uncommon The usual cause is either perforation of a single diverticulum of the sigmoid colon or



Appendicitis Leaking duodenal ulcer Pyelitis Acute pancreatitis Regional ileitis (exacerbation) Inflamed ileocæcal glands Inflamed Meckel s diverticulum Cholecystitis (low gall bladder) Biliary peritonitis

Tenderness and rigidity in right iliac region

FIG 12



Diverticulitis Pericolitis around cancer of colon *Pelvic peritonitis spreading upward*

Tenderness and rigidity in left iliac region

FIG 13

inflammation (pericolitis) round a segment of colon affected by many diverticula Sometimes a cancer of the iliac or sigmoid colon may perforate and cause local peritonitis in this region

Even in this area the real origin of the trouble may be the diseased appendix, for with a perforated pelvic appendix the inflammatory process may rise up out of the pelvis on the left side and appear to arise in the left iliac region Moreover, very rarely the appendix is actually situated on the left side of the abdomen

Hypogastric pain and rigidity

Hypogastric pain and rigidity in a young or middle aged man is usually due to a perforated inflamed appendix while in an older man an alternative diagnosis would be a perforated diverticulum The same symptoms in a young woman might be due either to a diseased appendix or to a pathological condition of the uterus Fallopian tubes or ovaries The differential diagnosis is considered more fully on page 69

protective adhesion, or when, after being localized, the inflammatory process extends, not even the most stoical or insensitive patient can refrain from seeking advice and taking to bed

Obstruction of the lumen of the appendix, either by a concretion, stricture, kink, or adhesion, is usually accompanied by more acute and severe symptoms So definite is the difference that some describe two forms of the disease—acute appendicitis and acute appendical obstruction So far as this differentiation tends to emphasize the usually greater urgency of symptoms with obstruction of the lumen of the appendix it serves a useful purpose but to treat the obstructive form as a different disease is quite unnecessary

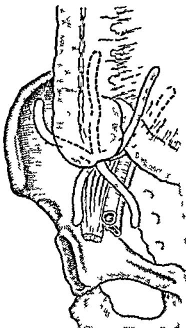


Fig 14—Diagram to show the various possible positions of the appendix vermiformis

When the appendix has ruptured, the pathological condition is not merely appendicitis, but peritonitis—local, diffuse, or general as the case may be—and diagnosis is to that extent more complicated It is frequently only by careful attention to the history that one can make certain as to the true cause of such peritonitis

Anatomical position of the appendix in relation to symptoms

The vermiform appendix, though usually described as being situated behind the ileo cæcal junction, with the tip directed towards the spleen, is not by any means always found in that situation when it is diseased and sought for by the surgeon The realization of the common positions is of great importance in diagnosis, for the signs and symptoms vary considerably in the various positions The accompanying diagram shows the more common positions (Fig 14) For descriptive purposes it is well to recognize the ascending appendix, the iliac appendix and the pelvic appendix It is clear that when the appendix lies by the side of the ascending colon, or in the iliac fossa there will be the most definite local signs, whilst if it be situated behind the cæcum or behind the end of the ileum and the common mesentery the inflammatory process will be somewhat masked by the gut lying in front If the appendix hangs over the right brim of the true pelvis the disease may give rise to few signs

in the suprapubic region of the abdomen, and a dangerous condition results to which we shall call attention below

Very many, if not most, of the mistakes made in the diagnosis of appendicitis are due to a failure to realize the very great difference in signs and symptoms which follow from the varying positions and relations of the appendix

DIAGNOSIS OF APPENDICITIS BEFORE PERFORATION HAS TAKEN PLACE

In any case of suspected appendicitis one must consider carefully

(a) The history immediately prior to the onset of pain
(b) The symptoms of the attack and the local signs
(c) The order of occurrence of the symptoms

The local conditions are more variable and notable after perforation has taken place but *there are definite indications even before* perforation

THE HISTORY

There is frequently a *history* of indigestion gastritis or flatulence for a few days prior to the onset of the attack In a patient who has never, or seldom, been subject to pain after taking food, this history should be sufficient to put one on guard It may be elicited that frequent slight attacks of pain have been experienced in the appendicular region

A history of unusual irregularity of the bowels is often obtained Sometimes there is constipation at other times diarrhœa especially in children The occurrence of diarrhœa is likely to mislead It is probably due to the activity in the cæcum and colon of the virulent microbes which cause such damage to the appendix In some cases an inflamed pelvic appendix may irritate the rectum This early diarrhœa has to be distinguished from the late variety due to irritation of the rectum by pelvic peritonitis or a pelvic abscess

THE SYMPTOMS AND LOCAL SIGNS OF THE ATTACK

The signs and symptoms are

Pain (epigastric, then right iliac)
Vomiting—nausea—acute loss of appetite
Local deep tenderness (per abdomen or per rectum)
Local rigidity of muscles (inconstant)
Local distension (inconstant)
Superficial hyperæsthesia (inconstant)

Fever
Constipation
Testicular symptoms (uncommon)

Pain

The pain in the majority of cases is first referred to the epigastric or umbilical region, and only later is localized in the right iliac fossa Occasionally the initial pain is felt "all over the abdomen" though that is more usual in cases with perforation Sometimes the pain is from the first hypogastric When the appendix is retrocæcal in position the initial pain may be felt in the right iliac region Though

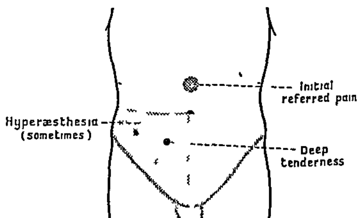


Fig 15 —Diagram to show the common position of initial referred pain the position of deep tenderness (nearly always to be elicited when abdominal wall not rigid) and the iliac triangle of hyper æsthesia found in many cases of appendicitis

therefore the pain commonly starts in the upper part of the abdomen this is not invariable

The causes of the early pain are probably two First and most important is the exaggerated peristalsis of the appendix excited by the relative or absolute obstruction to its lumen by a concretion kink, or swollen mucous membrane bacterial infection causes the accumu lation of irritating products which leads to a distension of the appen dical lumen Secondly the upper abdominal pain may sometimes be due to reflex pyloric spasm

The epigastric pain is most acute and distinct in those cases where there is considerable obstruction to the appendical lumen *The locali zation of the pain to the right iliac region usually takes place some hours after the onset of the diffuse pain in the epigastric or umbilical regions*

Vomiting—Nausea—Anorexia

Vomiting generally occurs in the early stages of the attack, but usually a few hours after the initial pain Many patients do not vomit, but instead have a sensation of nausea Loss of appetite or repulsion for food may be regarded as a lesser degree of the same sensation and often of equal value in diagnosis Anyone in previously good health who suddenly develops anorexia and complains of abdominal pain should be carefully watched for appendicitis The degree of nausea and the frequency of vomiting in the early stages appear to depend on two factors—first the amount of distension of the inflamed appendix and secondly the reflex nervous susceptibility of the patient Vomiting is more prone to occur in children, or in patients whose digestive tract is easily deranged

It may be taken as an important general rule that the severity and frequency of the vomiting at the onset of an attack of appendicitis indicate the degree of distension of the appendix and consequently the immediate risk to the patient that perforation may occur

Deep Tenderness

Local deep tenderness over the site of the appendix is frequently absent at the onset of the attack, and for some time the local symptoms are masked by the more general abdominal pains When the latter have subsided the local deep tenderness is easily elicited Occasionally even careful palpation cannot detect any spot of local tenderness in the iliac fossa during the *initial* stage of appendicitis The place where early deep tenderness can almost always be detected is a spot just below the middle of a line joining the anterior superior iliac spine and the umbilicus This roughly corresponds to the position of the base of the appendix Tenderness over McBurney s spot is not so constant This tenderness appears to be located actually in the appendix itself for the site of the pain on pressure varies somewhat according to the position of the appendix and is obtainable when that viscus is not adherent to any surrounding part Sometimes the tenderness may be due to adjacent peritoneal irritation The spot of maximum tenderness may sometimes be accurately located by gentle percussion over the affected region In the case of an appendix situated in the pelvis a rectal examination will frequently elicit pain when the finger presses on the inflamed organ

Hyperæsthesia

Local hyperæsthesia of the skin of the abdominal wall is a frequent but not a constant accompaniment of an inflamed unperforated

appendix It can be demonstrated in over half the cases of appendicitis Though *occasionally bilateral*, it is usually confined to the right side The areas affected nearly always lie in the area of distribution of the nerves from the tenth, eleventh and twelfth dorsal and first lumbar spinal segments Though occasionally a *zone of hyperæsthesia may* be found extending from the middle line in front back to the spine, yet as a rule only the anterior part of the abdominal wall is affected Sometimes the right iliac "appendix triangle" (Sherren) is demonstrable, at other times only a part of such triangle is hyperæsthetic (See Fig 16) As Sherren pointed out, hyperæsthesia depends largely on the degree of distension of the appendix A common place in which it can be elicited is a circumscribed area just to the right of and on a level with the umbilicus Sometimes the sensitive area is slightly lower than this, but generally it lies in the area of distribution *of the tenth and eleventh* thoracic spinal segments When there has been any local peritonitis in the iliac fossa one can frequently elicit a band of hyperæsthesia immediately above and parallel to Poupart s ligament

Rigidity

Local muscular rigidity over the inflamed area is frequently present but is by no means a constant finding in the initial stages There are several grades of muscular rigidity The extreme degree is that in which the particular section of the abdominal wall is persistently stiff and will not move on respiration in a lesser degree the muscle stiffens almost as soon as the hand touches the skin and in the least degree the rigidity occurs only (and that to a slighter degree) when the fingers *are pressed more deeply into the iliac fossa* or towards the appendix In most cases extreme muscular rigidity coincides with commencing peritonitis and even slight degrees, when persisting are due to irritation of the parietal peritoneum It is a common experience to find no local muscular rigidity in a case of appendicitis without any peritonitis In making this statement it must be understood that great care should be taken to exclude the rigidity which many patients develop as a result of nervousness and apprehension or *which may be* induced by a rough or cold examining hand Certainly with an unperforated appendix situated in the pelvis rigidity of the abdominal wall is *nearly* always absent Failure to realize this important fact is responsible for many delayed operations and lost lives *An appendix may be on the point of bursting into the general peritoneal cavity without a single adhesion to limit infection though at the same time the abdominal wall may be flaccid and allow a free manipulation without any rigidity appearing* This fact must be known to every

surgeon of experience, but in general it is certainly not fully appreciated nor do the textbooks make the point clear Rigidity is taught to be one of the earliest signs of acute inflammation of the appendix, whereas in quite a large proportion of cases it is almost completely

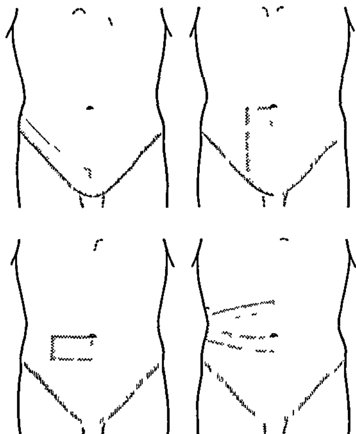


FIG 16—Types of hyperæsthesia (to pin stroke) which may be found in cases of acute and subacute appendicitis

absent in the earliest stage and in some cases is absent even though pelvic peritonitis exists

When the inflammation of the appendix has caused œdema of the contiguous portions of the abdominal parietes (whether posterior lateral or anterior) muscular rigidity is the rule

Rigidity of the psoas should always be tested for by extending the right thigh with the patient on the left side Rigidity of the quadratus lumborum should be present with an inflamed ascending appendix

It is difficult to ascertain, but may be surmised if deep resistance be felt on pressing the fingers forward from beneath the lower posterior costal margin

Fever

Fever may not be present at the beginning of the attack, but nearly always develops before twenty four hours have passed Before rupture has occurred the temperature does not usually go much above normal two or three degrees Fahrenheit being the average elevation Mistakes are liable to be made owing to the fact that the temperature is not elevated at the time of the onset of the pain and thus the more serious disease may be mistaken for an attack of simple intestinal colic In any suspected case the temperature should be taken every two to four hours and if it rise in a gradual manner it is a point in favour of appendicitis If at the very beginning of any attack of acute abdominal pain the temperature is considerably raised (i e 103° F or 104° F) the presumption is against appendicitis Very rarely the illness may start with a rigor

Constipation

Though the patient frequently complains of constipation yet numerous cases occur, particularly in children, in which an attack of diarrhœa ushers in the attack

Pulse

The pulse is only slightly, if at all accelerated in the early stage, it may be normal in every way even though the temperature be raised *Any continued or decided acceleration of the pulse either corresponds with the occurrence of local peritonitis or indicates an appendix distended with infective material*, to wait for such alteration is therefore to sacrifice the best time for operation

Distension

When the appendix is acutely inflamed *gaseous distension of the cæcum* is frequently present, this *local distension* is due partly to the excessive formation of gases by the active bacterial decomposition of the contents of the cæcum and appendix, and probably in some cases partly to an accompanying inflammation of the interior of the cæcum (typhlitis) with atony of the gut It is more likely to be present when the appendix is retrocæcal in position and closely embedded in the wall of the cæcum It gives rise to a local swelling with a tympanitic note on percussion, to borborygmi, and occasionally to painful peristaltic waves This may cause the observer to think that he is merely

dealing with a case of cæcal dyspepsia and the swelling of the cæcum may mask the inflamed appendix placed behind it, or the painful contractions of the distended gut attempting to empty itself may even suggest intestinal obstruction

Testicular symptoms

In the male, testicular symptoms are sometimes produced by an inflamed appendix even when unperforated There may be pain in either right or left testicle, or in both or the patient may say that the right testicle was retracted at a certain stage of the disease The pain may possibly be due to irritation of the sympathetic filaments accompanying the spermatic artery, but it is more likely that it is a pain truly referred from the appendix since the tenth dorsal spinal segment apparently supplies both viscera The direct stimulation of the genito crural nerve by inflammatory exudate might account for testicular retraction

THE ORDER OF OCCURRENCE OF THE SYMPTOMS

This is of utmost importance in diagnosis It is largely due to J B Murphy that the significance of the sequence of symptoms has been realized The march of events is

1 Pain usually epigastric or umbilical
2 Nausea or vomiting
3 Local iliac tenderness
4 Fever
5 Leucocytosis

Murphy stated 'The symptoms occur almost without exception in the above order and when that order varies I always question the diagnosis' Everyone who has carefully investigated the point must be able to confirm this dictum though it must be allowed that occasional exceptions occur If fever precedes the onset of pain if vomiting accompanies or precedes the first bout of pain it is generally not appendicitis with which we are dealing

It is a fact worthy of remembrance that an acute attack of appendicitis often starts in the middle of the night, and may awaken the patient out of sleep

There are two or three facts about the *retrocæcal* appendix that need special mention Pain is usually less and is often from the first felt only locally Vomiting is not so frequent and generally the muscular rigidity over the diseased focus is less than would be expected for so advanced a lesion

The diagnosis of appendicitis in the stage prior to perforation

depends therefore upon certain constant and other inconstant features Epigastric pain, nausea or vomiting, right iliac pain and fever in that symptom sequence, are almost constant, and local tenderness either on deep pressure in the right iliac region or by rectal examination is invariable, except in the first hour or two of the attack Local rigidity is common but not constant The other symptoms mentioned above are inconstant, whilst the pulse rate is usually normal and may mis lead seriously

In those rare cases in which, owing to developmental anomaly, the cæcum and appendix lie in the left instead of the right iliac fossa the local symptoms and signs will be found on the left side This condition is sometimes accompanied by dextrocardia, the existence of which should make one particularly careful in investigation of abdominal pain

DIAGNOSIS AFTER PERFORATION HAS OCCURRED

It is to be regretted that so great a number of cases of acute appendicitis come to the surgeon after the appendix has perforated at the site of a patch of gangrene One reason for this is that practitioners who send cases to surgeons are not always able to see the operations performed and consequently fail to realize that the symptoms of appendicitis as described in many textbooks are those which accompany appendicitis with perforation of the appendix It is common for practitioners to be surprised at the advanced state of the pathological process in cases where they thought they were advising an early operation It is from those doctors who see their cases operated on that the early cases come Local abscess means perforation of the appendix and some estimate may thus be formed of the relative proportion of perforated and unperforated cases In hospital practice probably the proportion of perforated and unperforated cases would be about equal In private practice one obtains a larger proportion of unperforated cases It must be allowed that in a few cases the first symptoms that the patient complains of seem to be those due to a perforation, but these cases are the exceptions

The symptoms and course of illness consequent on appendicitis with perforation of the appendix are those already described with the addition of the *symptoms due to local or diffuse peritonitis* There are usually an accession of pain and renewal of vomiting when the perforation occurs but the exact symptoms vary according to the position of the appendix and the nature of the protective peritoneal reaction

Round the perforation itself a localized abscess may form but sometimes a piece of omentum may seal the opening or more rarely

the infection may spread quickly and widely without the formation of any or many adhesions A definite lump is often, though by no means always, indicative of a perforation In the absence of a perforation a lump may be caused by a thick and œdematous cæcum

There are two main divisions of the pathological states consequent upon perforation depending upon the position of the appendix itself

1 when the appendix is above the brim of the true pelvis,
2 when the appendix lies wholly or in part in the true pelvis

THE ILIAC APPENDIX

Perforation of an appendix lying in the iliac fossa leads to rigidity of the overlying part of the muscular wall of the abdomen When seen a little later a lump may be felt and the rigidity may have lessened Later still there may be simply a tender lump

In addition there will be fever (higher as a rule than before perforation) hyperæsthesia of the skin of the abdominal wall in the right iliac or right lumbar region and certain localizing signs varying according to the position of the appendix

(a) When the appendix perforates retrocæcally there will be a lump which may be resonant on percussion owing to the intervening cæcum The infection will cause inflammatory œdema of the iliacus and quadratus lumborum and adjacent parts and tenderness will be elicited on pressing the fingers forward below the right costal margin at the outer border of the erector spinæ

(b) The appendix may lie in a position parallel with the cæcum and ascending colon but lateral to them The symptoms are then similar to those just described save that rigidity of the lateral and anterior abdominal wall is more evident and any lump is more easily felt because the cæcum does not mask it

(c) The conditions resulting from perforation of an appendix lying in the iliac fossa on the iliacus or psoas are sufficiently characteristic Immediately after the perforation there will be intense rigidity of the abdominal wall over the right iliac region and great tenderness on pressure over the same area (Very rarely chiefly in patients suffering from severe toxic absorption rigidity which had at first been present disappears on perforation of the appendix) After a certain time if suitable resistance be offered to the infection the peritoneal reaction becomes limited and the rigidity usually diminishes somewhat allowing the palpating hand to feel a tender lump—due either to a small local abscess or a mass of omentum wrapped round the inflamed perforated appendix

There are two special symptoms which may help exact localization

in this region The irritation and reflex rigidity of the ilio psoas frequently cause the patient to hold the right thigh flexed, or with a lesser degree of irritation pain may be felt if the right thigh be fully extended as the patient lies on the left side This sign is often of great value

In a few cases irritation of the external cutaneous nerve as it crosses the iliacus is evidenced by pain and hyperæsthesia along the distribution of that nerve

(*d*) When the appendix lies so that the tip is directed medialwards the result of its perforation varies greatly according to whether it is behind or in front of the ileum If *behind the ileum* localization of the inflammatory process usually results, but the swelling is not so readily felt since the ileum covers and masks it But tenderness and rigidity may be present, and an indefinite lump may be felt, whilst the test for psoas irritation may help in diagnosis

The ureter crosses the pelvic brim in close relationship to the medially directed appendix, and occasionally pain on micturition may be produced presumably by irritation of the ureter

J A Kerr has done well to call attention to the lack of physical signs and the paucity of symptoms which may accompany an attack of acute gangrenous appendicitis when the appendix is fixed behind the end of the ileum He points out that in the early stages of the attack the ileum is irritated and the bowel contents pass on quickly, giving rise to the passage of several small motions, while in the later stages, after the appendix has perforated, the subsequent symptoms of obstruction of the lower ileum may mislead the observer as to the cause of the trouble (*The Lancet* 1955, **1**, 736)

It will be noted that this is another example of the extra difficulty and danger in diagnosis when the appendix is contiguous to a non demonstrative area of the peritoneum

If the appendix perforates whilst lying *in front of the ileum* there is great danger of very extensive peritonitis but if the infection becomes localized diagnosis is fairly easy for the formation of pus close up against the abdominal wall leads to local boardlike rigidity and exquisite tenderness (hyperalgesia) over the affected area Psoas irritation will be absent

THE PELVIC APPENDIX

The early symptoms of an attack of appendicitis when the appendix is situated in the pelvis are similar to those which ensue when it is situated above the pelvic brim with the exception that rigidity of the right iliac region of the abdominal wall is seldom present in the early stages and that the pain is more frequently felt in both left and right

iliac fossæ Pain is not so readily localized in the right iliac fossa, but is always felt on deep pressure at the brim of the true pelvis and the epigastric pain may dominate the scene for a longer time

The perforated pelvic appendix is one of the most easily overlooked and therefore one of the most dangerous conditions which may occur in the abdomen The reason appears to be as follows Whilst the appendix is unruptured and tense the pain due to the distension and peristaltic contraction is definite and severe and is felt chiefly in the epigastrium or umbilical zone When rupture occurs the epigastric pain diminishes and local pelvic peritonitis results on the right side of the pelvis or at the bottom of the pelvic pouch of peritoneum *This is usually unaccompanied by rigidity of the lower abdominal muscles* and since the pain of appendicular distension has ceased and the pain due to pelvic peritonitis at this stage is frequently very insignificant the patient may seem better, and the examination of the abdomen may give little indication of the trouble in the pelvis Sooner or later—usually within three or four days—the peritonitis either becomes definitely localized into a pelvic abscess of considerable dimensions or the inflammation may track upwards towards the general abdominal cavity and give rise to increasing pain distension, and rigidity of the abdominal wall If, from the fact that the patient came late for advice or that sufficient attention was not paid to the preliminary symptoms and symptom sequence the pre rupture stage of the inflamed pelvic appendix is missed it is at least essential to diagnose the ruptured appendix as soon as possible after rupture before peritonitis has extended too far upwards into the abdominal cavity For this purpose it is important to pay attention to the anatomical position of the pelvic appendix which lies in relationship with one or more of the following—*the pelvic wall the rectum and the bladder* Irritation of the bladder or rectum may be signified by frequency of or pain during micturition or by diarrhœa or tenesmus respectively But more important is the fact that usually a tender

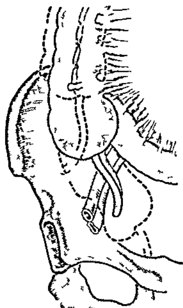


FIG 17 —Diagram to show positions the cæcum may occupy

swelling can be felt against the right pelvic wall by the finger inserted into the rectum Moreover, when the ruptured appendix is adherent to the fascia covering the obturator internus and the subjacent fibres of the muscle are affected by the inflammatory œdema rotation of the flexed thigh so as to put the muscle through its extreme movements (especially internal rotation) will cause hypogastric pain In performing this manœuvre it is essential that the thigh be flexed so as to relax the psoas muscle

By a careful consideration of the history and of the points just mentioned it should be difficult to miss the early inflamed pelvic appendix The appendix which is most likely to give rise to doubt in diagnosis is one situated high up in the right posterior quadrant of the pelvis, for in this situation there may be no localizing signs and it may be difficult to feel the viscus per rectum

The later symptoms resulting from rupture of a pelvic appendix are either those of a large pelvic abscess or those of advanced pelvic and hypogastric peritonitis with increasing toxæmia Tenderness and rigidity of the whole lower abdominal wall distension vomiting and increased pain, all give a clear picture of peritonitis

It is noteworthy that as the peritonitic inflammation spreads upwards from the pelvis it does so frequently on the left side first This is probably because as the pelvis fills with pus the anatomical path of least resistance is by the side of the sigmoid colon

When a pelvic abscess has formed there are usually all the symptoms of suppuration—fever, furred tongue anorexia and leucocytosis whilst locally there are tenderness and slight distension in the hypogastrium Rigidity of the lower abdominal wall is quite frequently absent, even when a pelvic abscess is present Occasionally the temperature may be normal even though an abscess be present

Per rectum the bulge of the abscess can easily be detected and pain is produced by pressing on the bulging mass

In women the intervention of the uterus makes bladder symptoms less likely to supervene in cases of appendicular suppuration The normal uterine loss may be increased by the pelvic congestion and the menstrual period may be precipitated thereby

There is a rare condition of intestinal obstruction which is said to be produced by pelvic appendicular suppuration at a late stage Both the sigmoid colon and the small intestine may be obstructed within the pelvis Mr Handley has termed the condition *ileus duplex* But if the inflamed pelvic appendix were diagnosed in the early stage there would never arise any such dangerous late complication In early diagnosis and operation lies the prevention of such conditions

VI

THE DIFFERENTIAL DIAGNOSIS OF APPENDICITIS

Diagnosis of appendicitis is usually easy Considerably over 50 per cent of the acute abdominal emergencies admitted to a hospital are cases of appendicular inflammation So frequent is the condition that it would almost appear that some do not trouble to attempt a differential diagnosis since many mistakes are made which might easily be avoided by a careful examination

The typical case with epigastric pain followed by vomiting succeeded by localizing of the pain in the right iliac fossa where tenderness can always and rigidity of the overlying rectus can usually, be made out is sufficiently characteristic even without the presence of slight fever to make the diagnosis certain But there are certain difficulties which need to be discussed

Influenza

It is important first to make quite sure that one is dealing with a primarily abdominal condition In the course of a definite attack of influenza abdominal pain may ensue and during an outbreak of the disease there is grave danger that occasionally an attack of appendicitis may be overlooked and attributed to abdominal influenza , But seldom in influenza is the abdomen alone attacked and a local examination will usually determine whether the site of the pain be appendicular Yet pain and tenderness in the right iliac fossa are sometimes present in influenza though the abdominal pain is more likely to be general and borborygmi may sometimes be heard all over the abdomen Backache and pain in the eyeballs are more likely to be felt in an attack of influenza and vomiting may precede the abdominal pain—a sequence seldom seen in appendicitis

Diaphragmatic pleurisy

Again one must always exclude diaphragmatic pleurisy or early basal pneumonia before diagnosing appendicitis Pain tenderness and muscular rigidity may all be noted in the right iliac region in thoracic disease but sometimes firm continued pressure will enable one to feel deep into the iliac fossa without causing any increase of the pain In cases of appendicitis pressure over the left iliac fossa carried out by

fingers pressed deeply in and directed towards the right side will sometimes cause pain in the appendicular region—a sign which is absent in cases of pleurisy or pneumonia In thoracic disease the respiration rate is usually increased, and the pulse respiration ratio diminished *Of course a careful examination of the chest is the* method of discrimination

Spinal disease

Very rarely spinal disease may cause pain referred to the appendicular region An examination of the spinal column can easily and quickly be made, and would soon determine any lesion On one occasion I have known osteomyelitis of the ilium simulate acute appendicitis In this case the boy looked very ill, had fever and local iliac pain, but there was no muscular rigidity

Typhoid

Typhoid fever is another general disease which is occasionally mistaken for appendicitis, because of the abdominal pain and tenderness which are sometimes localized in the right iliac fossa In most cases, however, there are general symptoms which would enable the diagnosis to be made Headache, general malaise, enlargement of the *spleen presence of a roseola and the absence of the acute* onset so usual in appendicitis, should make one suspect typhoid, and the absence of a leucocytosis would exclude appendicitis In children in whom the general symptoms of typhoid fever are often slight and occasionally in adults attacked by the ambulatory type of the disease mistakes might be made In some doubtful cases the presence of definite cutaneous hyperæsthesia would decide in favour of appendicitis

A true typhoid appendicitis is sometimes seen I once operated on a lad who had typical symptoms of appendicitis, and removed an appendix crowded with thread worms and having an ulcerated mucous membrane The pathologist who examined the appendix stated that he had never previously seen ulceration caused by thread worms alone *The child s temperature kept up in an irregular manner* after operation *and an agglutination test to Salmonella typhi (Eberthella typhosa)* proved positive This kind of case in which the symptoms of a true typhoid appendicitis initiate the illness, is uncommon

If the symptoms have been present for a week when the patient is first seen the agglutination reaction may be positive in respect to *Salm typhi (Eberthella typhosa)* or *Salm paratyphi A* or *B* A blood culture of a typhoid patient might prove positive if taken within the *first week of the disease One must* utter a warning against treating

any doubtful case as typhoid without making a rectal examination The irregular fever, tympanitic abdomen, and vague hypogastric pains which accompany a pelvic abscess may be, and have been mistaken for typhoid fever, but a finger inserted into the anal canal will serve to distinguish, unless the abscess be due to leakage of a typhoid ulcer

Minor abdominal disturbances

In the stage of *catarrhal* appendicitis before there is any or much congestion or inflammation of the peritoneum and when muscular rigidity is often if not usually absent, appendicitis is sometimes mistakenly diagnosed as

Gastritis	A bilious attack
Indigestion	Colic

The fact that the initial pain is frequently felt in the epigastrium is responsible for the diagnosis of gastritis or indigestion The sudden onset, often without any relationship to food taking (e g in the middle of the night) together with the gradual localization of pain in the right iliac fossa and the onset of slight fever, should give sufficient grounds for a diagnosis The danger is that with such slight symptoms the observer may not even make a thorough abdominal examination, or may omit a rectal examination whereby an inflamed pelvic appendix might be diagnosed

When vomiting or nausea is a notable feature of the attack it is sometimes erroneously attributed to a *bilious attack* This is especially the case with children, in whom such a diagnosis must always be carefully made, and only after appendicitis has been fully excluded It is a common experience for the surgeon who has removed a gangrenous appendix from a child's abdomen to be told by the parents or practitioner that the child had always been subject to bilious attacks for one of which attacks the acute illness had at first been mistaken Any child previously in good health who is suddenly taken with abdominal pain and loss of appetite has nausea, or vomits and at the same time shows definite deep tenderness in the right iliac fossa, even if the pulse be normal and the temperature not elevated is most probably suffering from appendicitis

Before a diagnosis of *intestinal* colic be made appendicular colic must be excluded If a few hours after the onset of the pain there still be no tenderness elicited on pressing over the right iliac fossa or right pelvic brim and none on the right side of the pelvis (by rectal examination) it may fairly be excluded In simple colic, pressure on the painful part often relieves the pain

Infective hepatitis

It is well to remember also that some patients who suffer from infective hepatitis complain of abdominal pain in the early stage of the disease, and it is easy for this to give rise to a suspicion that the appendix may be diseased As a rule however, the pain does not localize in the right iliac fossa Inquiry may be made as to the prevalence of other cases of hepatitis, and of course when the jaundice appears the problem will be solved

COMMON CONDITIONS THAT MAY SIMULATE APPENDICITIS

When the local signs and symptoms of appendicitis are well developed (pain, tenderness, hyperæsthesia, rigidity) there are very many conditions which have to be excluded, and for which it may be mistaken When the local signs are very clear the appendix is usually either perforated or in danger of perforating To catalogue the diseases which *may* simulate or be simulated by appendicitis is to enumerate all the chief acute abdominal diseases This is obviously of little practical value It will be better therefore to give only the more common conditions causing mistakes and to group them according to the position of the appendix

The ascending appendix (retrocæcal or paracæcal)

- Cholecystitis
- Inflamed duodenal ulcer
- Perforated gall bladder
- Perinephric abscess
- Hydronephrosis
- Pyonephrosis
- Pyelitis
- Stone in the kidney
- Torsion of the omentum

Iliac position of appendix

- Leaking duodenal ulcer
- Crohn's disease
- Cæcal or ileo cæcal carcinoma
- Tuberculous ileo cæcal glands
- Stone in ureter
- Inflamed Meckel's diverticulum
- Psoas abscess
- Tuberculous hip disease
- Rupture of rectus muscle
- A true typhlitis

Pelvic position of appendix

- Intestinal obstruction
- Diverticulitis with abscess
- Perforation of a typhoid ulcer

In women

- Ectopic gestation
- Twisted pedicle of an ovarian cyst or of a hydrosalpinx
- Rupture of a pyosalpinx
- Salpingitis

Before diagnosing appendicitis in tropical climes one would also have to exclude

Amœbic typhlitis
Hepatitis
Leaking liver abscess
Malaria

When the local manifestations have spread widely and the patient first comes under observation with generalized peritonitis it is necessary to distinguish the condition from all the various causes which may lead to such a pathological picture

Late cases with extensive peritonitis must be distinguished from

Acute intestinal obstruction (Chapter VIII)
Thrombosis or embolism of mesenteric vessels (p 123)
Acute pancreatitis (p 85)
Pneumococcal peritonitis (p 173)
Pylephlebitis
General peritonitis (ruptured gastric, duodenal typhoid ulcers etc p 169)

DIFFERENTIAL DIAGNOSIS OF THE PERFORATING OR PERFORATED ASCENDING APPENDIX

The gall bladder, the duodenum and the kidney are the viscera in anatomical proximity to the ascending appendix and inflammation of them or their surroundings may cause difficulty in diagnosis

Cholecystitis

Cholecystitis may very closely simulate appendicitis Pain vomiting fever, constipation and local tenderness on the right side of the abdomen are present in both cases An enlarged inflamed gall bladder frequently comes down into the right lumbar region but more usually enlarges in the direction of the umbilicus In thin subjects without rigidity of the abdominal wall diagnosis is usually easy for the tender rounded gall bladder may be felt continuous with the liver and perhaps moving with respiration The pain in cholecystitis is usually a little higher than that of an ascending appendicitis and there may be pain of a segmental nature referred to the right subscapular region especially if a stone be impacted in the cystic duct There may be resonance of the ascending colon over an inflamed retrocæcal appendix There is never resonance in front of an inflamed gall bladder which is usually on a plane anterior to the cæcum colon and appendix In very stout subjects and in patients with very rigid abdominal muscles it may on occasion be almost impossible to diagnose whether the appendix or gall bladder be at fault without giving an anæsthetic unless the previous history be clearly indicative of one or other condition

When with the cholecystitis a stone is simultaneously impacted in the cystic duct the constant spasms of pain accompanied by retching with deep tenderness in the right hypochondrium and right subscapular region are sufficiently diagnostic and clearly differentiate from appendicitis

Periduodenitis

Periduodenitis round an inflamed duodenal ulcer should be distinguishable by the characteristic history elicited by careful questioning The pain of duodenal ulcer comes two or three hours after food and is relieved by the taking of food

Pyelitis

Acute right sided pyelitis is frequently mistaken for appendicitis and not infrequently operations are unwisely undertaken because insufficient attention is paid to the symptoms The points in differential diagnosis can be tabulated as follows

Acute Pyelitis	Appendicitis
Initial rigor common	Rigor unusual
Temperature 103° F or more	Temperature so high as 103 F uncommon
Pain on micturition	
Increased frequency of urination	Urinary symptoms inconstant
Abdominal muscles often lax	Local rigidity frequent
Pus or bacteria in urine	No pus in urine

The reader will note that it is unusual for a rigor to occur in a case of appendicitis If a rigor or rigors do occur in a patient who is undoubtedly suffering from appendicitis, then it is possible, nay likely that there is an immediate danger of portal pyæmia At the operation special attention should be paid to the condition of the tributaries of the superior mesenteric vein, and during convalescence the possibility of hepatic abscess should be borne in mind In the elderly, however, a rigor may occasionally occur without sinister significance

The symptoms of acute pyelitis may be produced by the presence of bacilli in the urine without any or much formation of pus In such cases there is always a turbidity or opalescence of the urine which is suggestive of the bacilluria One must not forget also that an inflamed appendix lying in front of the renal pelvis may actually cause an acute pyelitis

If the urine be carefully examined as a routine there will seldom be any difficulty in diagnosis

Hydronephrosis

Acute right sided hydronephrosis is sometimes misdiagnosed as appendicitis with abscess formation A hydronephrosis forms a rounded, tense, tender swelling which occupies the lateral aspect of the abdomen and can be felt well back in the loin The swelling is sometimes freely movable and usually rounded in shape It may be possible to feel a depression (corresponding with the hilum) on the medial side



(*a*)



(*b*)



(*c*)

Pelvic appendix abscess with acute ileal obstruction
(*a*) and (*b*) Erect and supine films
(*c*) Barium enema showing the pressure effect of the abscess on the sigmoid



(a)



(b)

Ileal obstruction by adhesions nine days after repair of right inguinal hernia
(a) Patient erect (b) Patient supine



(c)

Ileal obstruction by adhesions in right iliac fossa showing the value of the lateral radiograph with the patient supine horizontal X ray beam

The pain is sometimes of the type of renal colic and *there are usually urinary symptoms*—scanty urine, pain during or frequency of micturition etc It may be possible to ascertain a history of previous attacks corresponding to Dietl s crises Rigidity of the abdominal wall over the swelling is usually absent

Pyonephrosis

Acute pyonephrosis forms a swelling similar to a hydronephrosis but it is usually more tender more fixed and the general signs of constitutional disturbance are much greater, e g there are high fever, very furred tongue, and maybe other symptoms of toxæmia There may be pus in the urine

Movable kidney without hydronephrosis

A kinking of the reno ureteric junction may occur and cause severe pain in the loin and diminution of amount of urinary secretion without much swelling of the kidney The urinary symptoms lack of fever and relief of the pain when urine passes more freely serve to distinguish

Stone in the kidney or ureter

In those unusual cases in which appendicitis is accompanied by pain in the right testis it may closely simulate renal colic An X ray photograph should show the stone and differentiate Cases do occur however in which small ureteric calculi do not show on an X ray negative and then the character of the pain must be the deciding factor in diagnosis *In one case under my care acute pain in the right loin* radiating to the right testis, accompanied by fever and some muscular rigidity caused me to diagnose renal colic A radiograph showed a large shadow a little external to the normal line of the ureter Operation revealed a normal kidney and ureter but a very inflamed appendix with a large calcareous gland in the meso appendix Fortunately such cases are rare

Torsion of omentum

Torsion and strangulation of the whole or of a portion of the omentum may simulate appendicitis The part affected is usually to *the right of the midline and pain and tenderness will be noted to the* right of the umbilicus If the affected fat becomes adherent to the abdominal wall there may be superficial hyperæsthesia Vomiting is less common than in appendicitis but differential diagnosis before operation may be impossible Etherington Wilson has pointed out that the pain due to torsion of the omentum is usually relieved when

the patient lies down Sometimes there may be a history of undue exertion, and there may be a doughy tumour to be felt in the mid line or on the right side of the abdomen

Perinephric abscess

A suppurating retrocæcal appendix may form an ab cess in the neighbourhood of the kidney, and may be difficult to diagnose from a perinephric abscess of metastatic origin But the latter is insidious in origin, whilst appendicitis usually gives a typically acute history of onset In both cases there will be pain on pressing forward in the erector costal angle below the last rib Some patients with an inflamed retrocæcal appendix present atypical symptoms, have no initial epi gastric pain do not vomit, and present no rigidity over the inflamed area *These cases, however, are much more rapid in development than the usual metastatic perinephric abscess* A small retrocæcal or retro-ileal abscess of appendicular origin may easily be overlooked (See Fig 18)

DIFFERENTIAL DIAGNOSIS OF THE INFLAMED ILIAC APPENDIX

Inflammation of the iliac appendix is the most easy to diagnose, though there are many pitfalls

Perforated duodenal ulcer

A perforated duodenal ulcer is frequently misdiagnosed as appendicitis The escaping contents travel down to the right iliac fossa and give rise to all the signs of inflammation of the appendix It may be possible to obtain a typical duodenal or appendicular history The initial shock at onset is greater in the duodenal condition and there will al o be definite right hypochondriac tenderness Pain felt on the top of the right shoulder would be more in favour of a perforated duodenal ulcer If there be any obliteration of liver dullness in the absence of general abdominal distension a duodenal (or gastric) perforation is certain

Crohn s disease

Crohn s disease or regional enteritis may closely simulate acute appendicitis and appears to have become more frequent during the past few years There may be abdominal pain, vomiting local tenderness in the right iliac fossa and sometimes a palpable lump may be felt Unless the patient has been previously under treatment it may be impossible to differentiate before the abdomen is opened If the condition be subacute then the history of attacks of colicky pain the

occasional bouts of diarrhœa and (if a barium meal has been given) the very characteristic radiographic picture of a narrowed end of the ileum will reveal the true condition of affairs The diagnosis has however, frequently been made only after opening the abdomen for a supposed attack of appendicitis

Carcinoma of the ileo-cæcal junction causes subacute attacks of severe pain and local right iliac tenderness but the pain is more griping and persistent than in any but the most acute attacks of appendicitis Carcinoma of the cæcum or of the ascending colon may become adherent to the anterior abdominal wall and closely simulate an appendicular abscess The age of the patient (usually over fifty) previous attacks suggestive of obstruction, and noticeable loss of weight may put one on guard and the history of progressive anæmia and of attacks of diarrhœa would be in favour of cancer of the cæcum

Ileo cæcal tuberculosis of the non obstructive type may cause symptoms similar to those of carcinoma

Tuberculous ileo cæcal glands

Tuberculous ileo cæcal glands are easily mistaken for an inflamed appendix They occur chiefly in children and cause slight tenderness and maybe a lump in the right iliac fossa If the glands are fleshy and tending to undergo caseation they may cause inflammation of the contiguous mesentery and peritoneum and the local signs will be increased by the presence of greater local tenderness and possibly muscular rigidity Nausea or vomiting may occur but epigastric pain is not so likely to be in evidence and the typical symptom sequence will not be obtained Tuberculous mesenteric glands may be accompanied by an irregular fever An X ray photograph may show some calcification in the glands

Psoas abscess and *tuberculous hip disease* may each cause irritation of the ilio psoas with flexion or limitation of extension of the right thigh and tenderness, resistance and fullness in the right iliac fossa but the general onset and subacute nature of the illness, together with careful examination of the spine and hip in most cases easily establish the diagnosis A radiograph should be taken if doubt exists

Stone in the ureter

As already mentioned, a stone passing down the ureter causes pain not always typical of renal colic referred approximately to that section of the ureter in which the stone is lodged Quite frequently this causes a diagnosis of appendicitis to be made Urinary symptoms (frequency pain hæmaturia) pain in the testicle absence of rigidity over the painful area and a previous history of attacks suggestive of renal colic,

should put one on to the right line of diagnosis, and if expert assistance be available, radiography and cystoscopy with the passage up the ureter of the affected side of a wax tipped bougie may serve to demonstrate a calculus Fever is unlikely to be present in the case of ureteral stone

Meckel's diverticulum

Inflammation of a Meckel's diverticulum gives rise to symptoms which may be almost indistinguishable from those of acute appendicitis Since the diverticulum is usually nearer the centre of the abdomen and is not usually adherent anywhere, the pain may be central and poorly localized for a longer period

Abscess in the abdominal wall

An abscess developing in the abdominal wall in the right iliac region

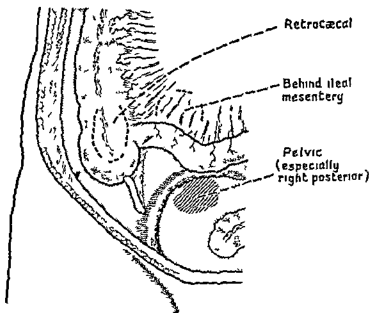


FIG 18.—Diagram showing those sites where an abscess resulting from appendicitis may sometimes be overlooked (See pages 56 and 71)

may be difficult to diagnose from appendicitis but the history absence of vomiting, and superficial localization without any deep signs, should differentiate

Rupture of right rectus muscle

Rupture of the lower segment of the right rectus muscle may also lead to local signs similar to those caused by appendicitis, but the history of onset should serve to distinguish Rupture of the rectus is prone to follow a great or sudden muscular effort or may be due to a severe bout of coughing Vomiting and intestinal symptoms will be absent

A true typhlitis sometimes occurs This may be localized to the region of an ulcer of the cæcum or it may occur around a small diverticulum of the cæcum Occasionally however, a true gangrenous inflammation of the cæcum occurs This may be indistinguishable from gangrenous appendicitis before exploration of the abdomen

DIFFERENTIAL DIAGNOSIS OF THE PELVIC APPENDIX

DIFFERENTIAL DIAGNOSIS IN THE MALE

Inflammation of an appendix situated in the pelvis gives rise to very many mistakes in diagnosis and in the case of women there is some excuse for this but in the male there are comparatively few conditions which cause severe acute pelvic pain and mistakes should not so frequently occur The chief conditions for which it may be mistaken are

Obstruction of the large intestine (carcinoma volvulus)
Obstruction of the small intestine
Diverticulitis
Stone in the lower part of the ureter

Obstruction of the large bowel

Obstruction of the large bowel causing hypogastric symptoms is commonly due to carcinoma of the sigmoid or rectum or to volvulus The onset of both these conditions is usually preluded by a time of subacute obstruction with attacks of abdominal pain and distension, and in both cases *distension is an early feature of the acute attack* In pelvic appendicitis the symptom sequence is fairly constant and distension is not an early symptom In both cases rectal examination will reveal pelvic tenderness but in ob truction there may be greater ballooning of the upper part of the rectum whilst in appendicitis there is often a tender lump on the right side of the pelvis and the thigh rotation test may be positive In appendicitis also there is not

complete obstruction, and a turpentine enema will bring away flatus and fæcal material Fever is usually absent in obstruction, and present in appendicitis

Obstruction of the ileum

Obstruction of the ileum, accompanied by tenderness in the hypogastrium, is frequently due to adhesions caused by former attacks of appendicitis The adhesions usually bind the end of the ileum down to the lateral wall of the pelvis or the bottom of the pelvic pouch of peritoneum The previous history of appendicitis may deceive Distinction is to be made chiefly by noting that in obstruction there is greater acuteness of pain which is of a spasmodic nature and by observing the frequency and character of the vomit, which in obstruction gradually becomes yellowish and finally fæculent—a change which never happens in appendicitis until extensive peritonitis has developed In intestinal obstruction the pain is seldom localized in the right iliac fossa as in appendicitis but after distension has supervened diagnosis is made much more difficult In small bowel obstruction also the temperature is usually subnormal at onset, and does not at any period become febrile as is usual in appendicitis Frequency of micturition or pain during the act may occur in appendicitis, owing to irritation of the bladder

Diverticulitis

Diverticulitis of the pelvic colon may cause either obstructive or inflammatory symptoms When causing obstruction it closely resembles carcinoma, but when local inflammation and abscess result the symptoms and signs are very similar to those of pelvic appendicitis, and there is no certain way of distinguishing before operation since in these cases a barium enema is inadvisable Diverticulitis is however, a condition chiefly met with in older persons and there may be a history of previous bowel derangement which may be referable to the colon e g attacks of diarrhœa and constipation, or passage of slime and blood etc The *initial* pain is more likely to be hypogastric in pelvic pericolitis and epigastric in appendicitis

Perforation of a typhoid ulcer

When, in a patient suffering from a mild attack of typhoid fever, a subacute perforation occurs in the lower ileum a pelvic abscess may result which may at the time of examination be indistinguishable clinically from that due to a perforated appendix But the diagnosis will be helped by the previous history In one case which came under

my care the patient had been treated for two weeks for influenza before the pelvic symptoms caused her to be sent up to hospital for appendicitis A pelvic abscess was opened and a blood agglutination test proved that *Salm paratyphi B* was the cause of the disease

Stone in the ureter

Stone in the lower part of the ureter (see p 67) —When a stone is near the bladder there are often additional symptoms, frequency, strangury pain in the penis, emissions which may point to the genito urinary system Cystoscopy might show a pouting right ureteric orifice and a catheter put up the ureter would stop at the site of the stone

Pelvic abscess

Instances occur in which the acute symptoms due to appendicitis are transient the inflammation becomes limited by adhesions or contiguous viscera and perforation may occur without the supervention of extending peritonitis In such circumstances the patient may not seek medical advice until an abscess has developed When the abscess is retrocæcal the observer will usually detect a lump in the right iliac fossa When the abscess has resulted from the perforation of an appendix situated in the pelvis the resulting abscess may reach large dimensions without being palpable above the pubis as the abscess increases in size it may cause pressure upon the rectum and the lower coils of the ileum leading to a true intestinal obstruction The course of the whole illness may be so insidious that the patient may first present himself with symptoms of obstruction of the ileum—colicky pain ladder pattern of distension etc The importance of a rectal examination is obvious and sometimes an X ray examination will be of assistance

Such a pelvic abscess may attain a large size without giving rise to obvious symptoms until its pressure on the end of the ileum may cause definite obstruction The cause of the alarming symptoms may not be obvious until a careful rectal examination has been made A boy was once admitted to my wards with symptoms of acute intestinal obstruction No apparent cause was discovered till a rectal examination revealed a large pelvic abscess Some days previously the patient had symptoms which were in keeping with an acute attack of appendicitis which had subsided before the obstruction had developed The abscess was opened per rectum the distension and vomiting subsided and the obstruction relieved without any need for an abdominal incision An X ray of a similar case is shown in Plate 1

DIFFERENTIAL DIAGNOSIS IN THE FEMALE

The female reproductive organs add considerably to the difficulty in diagnosis of pelvic appendicitis Acute pain referable specially to the hypogastrium and pelvis may be due to

Uterine colic (dysmenorrhœa or threatening abortion)
Twisted pedicle inflammation or rupture of an ovarian cyst or torsion of a normal or slightly enlarged ovary
Ectopic gestation
Twisted or inflamed fibroid
Twisted hydrosalpinx
Salpingitis or pyosalpinx
Rupture of an endometrioma

Dysmenorrhœa

Dysmenorrhœa, with its periodicity lack of signs on local examination, and pain referred to the lower lumbar and sacral regions as well as the hypogastrium should not cause serious difficulty in diagnosis

Threatened abortion

In threatened abortion the previous amenorrhœa bleeding character of the pain, and absence of local signs easily serve to distinguish

Ectopic gestation

Ectopic gestation is frequently misdiagnosed appendicitis but there is usually some menstrual irregularity, often a history of a fainting attack, general anæmia and a displaced uterus whilst the symptom sequence of appendicitis is not usually seen In unruptured cases the enlarged tube may be felt as an abnormal mobile and tender swelling to one side of the uterus (See Chapter XIV)

Ovarian cyst and hydrosalpinx

In the case of an ovarian cyst or hydrosalpinx with a twisted pedicle diagnosis is made chiefly by the fact that with the twisted viscus *the pain and vomiting come on simultaneously* (or almost so) so that the proper appendix symptom sequence is wanting moreover the vomiting or retching is usually more frequent and more persistent than in appendicitis In the case of an ovarian cyst it may have been previously known that there was a tumour and a definite tender swelling may be made out from the time of onset of the symptoms This swelling may be situated in the mid hypogastrium or to one or other side or may be limited to the pelvis Superficial hyperæsthesia to pin stroke in the right iliac region is commonly found with appendicitis but is less

frequently detected with an ovarian cyst Torsion of a normal ovary may occur If this happens in early pregnancy there may be difficulty in distinguishing it from an early ectopic pregnancy or a pelvic appendicitis

With a twisted fibroid the symptoms are not usually so acute and the presence of the fibroid will most likely have been known previously It may be impossible to differentiate between a twisted fibroid and an ovarian cyst with twisted pedicle

Acute salpingitis

Acute salpingitis is frequently difficult to distinguish from appendicitis and sometimes the two occur simultaneously Occasionally it is difficult to say in which of the contiguous organs the inflammation started Distinction may usually be made by considering the following points Acute salpingitis does not so frequently cause epigastric pain at the onset and vomiting is less frequent The salpingitic pain is frequently felt on both sides from the onset and there may be greater tenderness in the left iliac region than the right The history is often unreliable but the presence of a vaginal discharge is a valuable guide and examination should be directed to this point It has been stated that with salpingitis pain is more often felt down the thigh even as far as the knee but this is certainly not a constant symptom If in doubt it is better that operation should be undertaken but if there is no reasonable doubt that the condition is acute salpingitis there are many surgeons who consider non operative treatment by putting the patient into the Fowler position and giving rectal saline injections quite satisfactory The advent of penicillin to which the gonococcus is sensitive has made operative treatment of acute gonococcal salpingitis unnecessary

Pyosalpinx

A pyosalpinx may rupture and cause simulation of a pelvic appendicitis The typical appendicular symptom sequence is usually wanting If examination be made soon after the onset of symptoms a pelvic swelling will be felt This is usually bilateral A history of chronic pelvic pain and leucorrhœa may be ascertained In cases coming under observation after some days diagnosis may be impossible before operation

Ovarian endometrioma

Rupture of an ovarian endometrioma may closely simulate a pelvic appendicitis Sudden hypogastric pain vomiting slight fever and tenderness on pelvic examination may be present in both cases but

with an endometrioma a unilateral or bilateral swelling ought to be detected on bimanual examination

LATE CASES OF APPENDICITIS

In late cases of appendicitis which have led to a very diffuse or general peritonitis, or in those cases of a very fulminating type which are associated with a rapid form of spreading peritonitis, it is often impossible to make a certain diagnosis Distinction has to be made from

- Primary pneumococcal peritonitis
- Secondary general peritonitis due to other causes (rupture of gastric duodenal, typhoid stercoral, or carcinomatous ulcer, or of a pyosalpinx)
- Thrombosis of mesenteric vessels
- Acute intestinal obstruction
- Acute pancreatitis
- Pylephlebitis

In finding out the exact cause the greatest importance attaches to the history The subject is considered more fully in the next chapter and in that on peritonitis (Chapter XX)

VII

PERFORATION OF A GASTRIC OR DUODENAL ULCER, AND ACUTE PANCREATITIS

PERFORATION INTO THE GENERAL PERITONEAL CAVITY

PERFORATION OF a gastric or duodenal ulcer into the general peritoneal cavity is a catastrophe which occurs with dramatic suddenness, and unless correctly treated progresses in a definite manner with a typical course until the death of the patient about two or three days after the perforation It is one of the most easily diagnosed acute abdominal conditions provided the symptoms are known and appreciated and it is the most important to diagnose early and treat promptly, usually by surgical intervention We say this advisedly although we are aware that some cases have been and may be treated successfully without operation Delay in the diagnosis of appendicitis is regrettable but does not always cost the patient's life Misdiagnosis of an inflamed gall bladder or a pyosalpinx is a perilous occurrence but the position may frequently be retrieved by a later operation but in the case of a perforated ulcer a delayed diagnosis, or a misdiagnosis which leads to temporizing and delay is equivalent to a death sentence with very slight chance of reprieve If operation be undertaken within the first six hours recovery is the rule if the opening of the abdomen be delayed for twelve hours recovery is more doubtful if twenty four or more hours elapse prior to suture of the ulcer the death of the patient is to be expected True, some cases recover though operated on at a later stage than this but they are always regarded as exceptional and worthy of comment The very possibility of any condition being due to a perforated ulcer is a positive indication for an *immediate* solution of the problem If the problem cannot be solved with certainty, action should be taken for removal of the patient to the nearest surgical centre To leave the diagnosis in doubt overnight will most likely cost the patient's life if a perforation be present

The signs and symptoms produced by the perforation vary according to the time which has elapsed since the rupture occurred There are three stages in the pathological process which can usually be recognized easily

1 The stage of prostration or primary shock.

2 The stage of reaction (with masked peritonitis)
3 The stage of (advanced) frank peritonitis and secondary or toxic shock

There is no hard and fast limit between the stages, and occasionally primary shock may lead on to frank peritonitis and terminal collapse without any noticeable interval of reaction

The symptoms of each stage can be enumerated

Stage of prostration or primary shock

Great and generalized abdominal pain
Anxious countenance Livid or ashen appearance
Cold extremities *Cold sweating face*
Subnormal temperature (95° F or 96° F) Pulse small and weak
Shallow respiration Retching or vomiting
Pain on the top of one or both shoulders

Stage of reaction (masked peritonitis)

Vomiting ceases Abdominal pain less
Appearance much better, face regains *normal colour*
Temperature normal Pulse normal
Respiration still shallow and costal in type
Alæ nasi working slightly
Abdominal wall very rigid, tender, and often retracted or flat
Tender pelvic peritoneum Diminution of liver dullness
Movable dullness in flanks (sometimes)
Great pain on movement of the body

Stage of frank peritonitis with toxic shock

Vomiting more frequent Facies of late peritonitis
Abdomen tender and *distended* Pulse rapid and small
Temperature either slightly febrile or sub normal
Abdominal wall usually not quite so rigid
Respiration laboured and rapid

STAGE OF PRIMARY SHOCK

The initial symptoms are those due to the pain and shock consequent on the flooding of the peritoneal cavity with the gastric contents The sudden great stimulation of the innumerable nerve terminations by the irritating fluid escaping from the ruptured viscus causes reflex depression of the vital functions This may be so severe that the patient may feel faint or fall down in a syncopal attack The pulse temporarily is small and feeble the face livid the extremities

cold and the thermometer will only register about 95° F The face shows pain and anxiety, and the patient may cry out in his agony

The pain is sudden in onset The patient may be feeling well one moment, the next he is writhing in agony and crying out for someone to relieve him The site of the initial pain is generally epigastric but quickly it extends downwards, and in a short time is felt all over the abdomen The pain may even be greater in the hypogastrium, since the escaped fluid collects in the pelvis This stage may last for but a few minutes or persist for an hour or two Its length depends to a certain extent upon the size of the perforation and the degree to which the general peritoneal cavity is flooded In cases where the perforation is very small and soon sealed up by fibrinous exudate the symptoms of onset are correspondingly less severe In some instances of this kind the shock is almost absent and the pulse may be regular and full when seen shortly after the perforation

STAGE OF REACTION

The intensity of the initial shock subsides and the patient then looks better and feels more comfortable The circulatory system re covers to such an extent that the limbs may become warmer the face normal in colour and the pulse normal in frequency and strength whilst the thermometer may show no indication either of subnormality or fever The improvement in symptoms does not imply any stoppage of the pathological process, though the casual observer might easily think that real improvement were taking place Upon the proper appreciation by the practitioner of this dangerous latent period depends the patient s chance of recovery from the disease It is in this stage that the inexperienced house surgeon thinks he has made a mistake in summoning the surgeon so urgently and almost apologizes for having brought him up needlessly In this stage I have known a capable observer deluded into postponing the summons to the surgeon since the patient was sleeping peacefully But it is at this period that the favourable opportunity for operation passes nor should there be any difficulty in diagnosis if careful examination be made

No certain guide is to be obtained from the pulse and temperature for they are frequently normal nor is the patient s own opinion of his condition always to be trusted for he often expresses himself as feeling much better, and he may even begin to think lightly of his condition But his attitude and his acts will always belie his words Relief will be sought by the drawing up of the legs and if he be asked to turn over in bed the attempt is made cautiously and with evident dread of increasing the pain If no morphine has been administered there will still be complaint of generalized abdominal pain though the intensity

will not be so great as at first There are in addition five observations, some or all of which give valuable indication of the serious intra abdominal mischief The abdominal wall is rigid and tender, respiration shallow and of costal type, the pelvic peritoneum is tender, and there may be free fluid and free gas in the peritoneal cavity

The rigidity of the abdominal wall is a constant feature The muscles are flat and board like, and even firm pressure cannot make them give way It takes a fairly deep anæsthesia to cause them to relax Pressure on any part of the abdominal wall causes pain, and

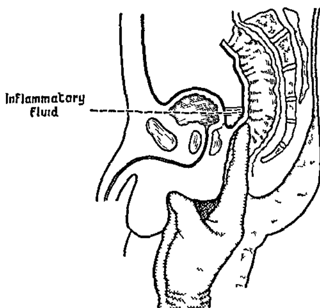


FIG 19—Drawing to illustrate how the pelvic peritoneum may be palpated and indicating where inflammatory fluid usually collects

may evoke retching Tenderness is often greater in the right iliac fossa in the case of a ruptured duodenal or pyloric ulcer The rigid muscles do not move on respiration, and the movement of the diaphragm is also considerably inhibited so that *breathing is shallow and of the costal type*

The *tenderness of the pelvic peritoneum* is a most important sign This can be determined by a rectal or in the female by a vaginal examination Within a very short time of a perforation the pelvis fills with escaped contents and inflammatory exudate, and though no lump can be felt, pressure against the pelvic peritoneal pouch through the rectal wall by the inserted finger produces pain which makes the

patient wince Remember, however that the tenderness of the pelvic peritoneum is not always present if the case is examined within an hour or two of perforation and if the opening be small or quickly sealed up

Movable dullness in the flanks due to free fluid in the peritoneal cavity should usually be determinable but the shifting of the patient necessary to elicit the sign is not always advisable In doubtful cases it may be of value

The diminution or absence of liver dullness is the sign produced by free gas in the peritoneal cavity It is often easily demonstrated, but is frequently ambiguous Percussion over the front of the liver may produce a resonant note even when no free gas is present in the peritoneal cavity, for it may result from distended intestine which is sometimes pushed up in cases of intestinal obstruction or peritonitis from any cause If there be no abdominal distension however diminution of the liver dullness anteriorly is significant It is always of significance to obtain resonance on percussion over the liver in the mid axillary line *If in any acute abdominal case distinct resonance be obtained over the liver in the mid axillary line about two or more inches above the costal border one is certainly dealing with a perforation of a gastric or duodenal ulcer* It is only in the minority of cases that the sign is positive

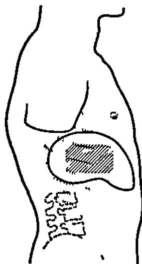


FIG 20—Diagram to indicate the area of hepatic resonance which is diagnostic of perforation of a gastric duodenal or intestinal ulcer

In doubtful cases, when X rays are available it is possible to get great help from a simple radiograph of the diaphragmatic region By this means small quantities of free gas between the liver and diaphragm may be observed (See Plate 4)

An additional symptom which may be helpful is the occurrence of pain on the top of the shoulder in the supra spinous fossa over the acromion or over the clavicle i e in the region of distribution of the cutaneous branches of the fourth cervical nerve This symptom if present has to be considered carefully with the other indications for diaphragmatic pleurisy causes similar pain but if the pain be felt on both shoulders *from the onset of the attack* it is suggestive of a perforation of the anterior wall of the stomach causing irritation of the median portion of the diaphragm In the case of a perforation of a

pyloric or duodenal ulcer the shoulder pain is usually felt in the right supra spinous fossa

THE STAGE OF FRANK PERITONITIS

This follows quickly after the stage of reaction

Locally the extensive peritonitis is clearly shown by increasing *distension of the abdomen* Distension of the abdomen is not a sign of a perforated ulcer—it is an indication that peritonitis is advanced, and that the condition has been allowed to proceed so far that the chance of recovery is slight Yet I have known delay in sending a case

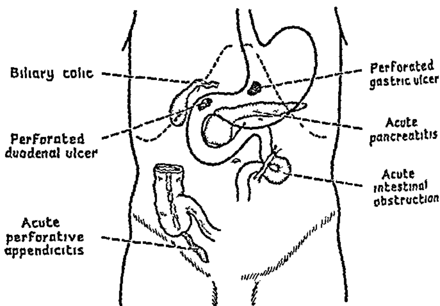


Fig 21 —Diagram to illustrate the more common abdominal causes of acute collapse (In the female ruptured ectopic gestation should be added)

to hospital because the one who suspected perforation thought that diagnosis could hardly be sustained in the absence of distension

The other effects of extensive peritonitis are increasing and persistent vomiting gradual increase in rate and depreciation in force and volume of the pulse, and the consequent decrease in temperature of the extremities and body generally The abdomen remains tender, but in late peritonitis the rigidity frequently lessens owing to the toxic effects on the neuro muscular system Finally, as a result of the vomiting and depressed circulation, the face becomes pinched and anxious the cheeks hollow and the eyes dim and beringed with dark circles the so called *facies Hippocratica*, which is not so much a sign of peritonitis as the mask of death following peritonitis



(*a*)



(*b*)

Ileal obstruction by a band (*a*) Patient erect (*b*) Patient supine Note the calibre of distended jejunal loops on the left side of the abdomen



(*c*)



(*d*)

Obstruction from volvulus of cæcum and ascending colon (*c*) Patient erect (*d*) Patient supine Note the siting of the apparent ileal coils in the left upper quadrant

PLATE 4



(*a*)

Free gas between the diaphragm and the upper surface of the liver in a case of perforated duodenal ulcer



(*b*)

Free gas between the liver and the lateral part of the diaphragm in a case of perforated duodenal ulcer

DIAGNOSIS

During the initial stage of shock it is nearly always possible to say that there is a condition needing surgical intervention though the exact nature of the catastrophe may be slightly doubtful Great help is sometimes obtained from a previous history of chronic indigestion or of duodenal pain coming on about two hours after food Quite a number of patients however, give but a recent history of pain after food This is more common in the case of young people in whom acute pyloric ulcers appear to be not uncommon, but I have had to deal with a perforated duodenal ulcer in a man of seventy six who had never previously had any symptoms of indigestion

If in one who has been subject to chronic indigestion sudden collapse and very severe abdominal pain suddenly supervene and if at the same time the abdominal wall becomes generally rigid one is justified in suspecting a perforation of an ulcer If in addition the pelvic peritoneum be tender, and there be resonance over the lateral aspect of the liver diagnosis is certain

In the stage of reaction the general symptoms temporarily improve but *all the local signs remain and become still more definite*, so that the careful observer should not be misled In the third stage there is no difficulty in diagnosing that some serious catastrophe within the abdomen has occurred

DIFFERENTIAL DIAGNOSIS

There are three conditions sometimes giving rise to symptoms similar to those of perforated ulcer which either do not call for operation or in which operative interference is positively contra indicated They are

Severe colic (either biliary or renal),
Gastric crises of tabes dorsalis
Some cases of pleuro pneumonia

There are five other conditions which commonly call for operative treatment and which are sometimes difficult to distinguish from a perforated gastric or duodenal ulcer They are

Acute pancreatitis
Acute perforative appendicitis
Ruptured ectopic gestation (in women)
Acute intestinal obstruction
General or diffuse peritonitis from other causes

To these should be added the rarer conditions of mesenteric thrombosis and dissecting aneurysm

Colic

Biliary and renal colic may cause severe collapse and terrible abdominal pain The extent of the collapse is not a differential point since in biliary colic the patient may sometimes appear *in extremis* but diagnosis is usually clear on a consideration of the previous history and condition of the abdominal wall, liver dullness, and pelvic peritoneum A clear account given of prior attacks of pain and jaundice, or hæmaturia and the passing of gravel or a small stone would serve to indicate the probability of a stone trying to pass down the biliary ducts or ureter respectively

The radiation of the pain of biliary colic to the subscapular region, and that of renal colic to the testicle, are sufficiently diagnostic. In stone colic the abdominal wall is not usually rigid, and the sufferer may throw himself about or writhe in agony while attempting to gain a more easy position After perforation of an ulcer the general abdominal rigidity and increase of pain on movement forbid and prevent movement *though occasional exceptions occur* Finally the pelvic peritoneum is not tender nor is there any diminution of liver dullness in biliary or renal colic If jaundice or hæmaturia be observed diagnosis will not be in doubt The pain of renal colic is nearly always strictly limited to one side

Tabes dorsalis

The gastric crises of tabes dorsalis may give rise to difficulty in diagnosis, for the intensity of the abdominal pain and the severity of the vomiting may cause extreme collapse It should be a rule always *to test the knee jerks and the pupillary reactions in every acute* abdominal case, for in tabes one or other of these is nearly always abnormal The patient moreover may give a history of previous similar attacks and on examination in a tabetic crisis there will be no rigidity of the abdominal muscles nor should there be tenderness on *examination per rectum nor resonance over the* lateral aspect of the liver It is to be remembered that a patient may have a perforated ulcer and be the subject of tabes but in such a case some of the last mentioned signs will be present *Persisting rigidity of the abdominal wall is never due to tabes* and tragic misdiagnosis may occur if this

respiration rate will be greater than one would expect with an early peritonitis without distension With pleuro pneumonia there is usually fever and a raised pulse rate Once more rectal examination and percussion over the lateral aspect of the liver are of importance in diagnosis

The other five conditions are all serious states which themselves call for an opening of the abdomen so that though important, it is not of such critical necessity to make a certain diagnosis before operating

Acute pancreatitis

This simulates visceral perforation very closely, and before the abdomen is opened is quite often mistaken either for that condition or for intestinal obstruction In pancreatitis the pain is even more agonizing but the abdominal rigidity is not so generalized nor so constant Cyanosis and slight jaundice are more often seen in pancreatitis, which usually occurs in fat subjects The diagnosis is further considered in the next section (p 85)

Acute appendicitis

This should easily be distinguished by consideration of the history, the order of the symptoms and the local signs It is infrequent for inflammation of the appendix to cause such acutely severe symptoms as those ushering in a gastric perforation but in the stage of reaction a perforated ulcer may be and often is misdiagnosed as appendicitis Especially is this the case with a leaking duodenal ulcer for the escaped contents may trickle down chiefly on the right side of the abdomen and cause pain particularly in the right iliac fossa This simulates appendicitis closely for the sequence—epigastric pain nausea and vomiting right iliac pain and fever—may be produced just as in inflammation of the appendix The intensity of the initial collapse may serve to distinguish and the persistence of tenderness over the duodenal area should help to determine the condition In appendicitis the abdominal rigidity is seldom so extensive as in perforated ulcer and the liver dullness is normal though in both cases there may be rectal tenderness In many cases of perforated duodenal ulcer the patient may complain of pain on the top of the right shoulder or over the right supra spinous fossa very rarely is shoulder pain felt in appendicitis and when felt (due to irritative fluid reaching the diaphragm) the pain would be more likely felt over the acromion or clavicular region In both cases operation is indicated

Intestinal obstruction

This should not give rise to difficulty save in those cases which

come late for diagnosis Acute strangulation of a coil of small bowel is the most likely type to cause difficulty In both conditions the onset may be with acute symptoms of collapse, pain, and vomiting and in both there may be evidence of free fluid in the abdomen but in obstruction the abdominal wall is usually flaccid and quite unlike the rigid board like condition in perforated ulcer In acute obstruction vomiting is almost from the first a distinctive feature and the character of the vomit gradually changes until it is fæculent

In the late stages of both conditions it may be difficult to distinguish between them, for peritonitis is often a complication of late intestinal obstruction and the board like rigidity accompanying a perforated ulcer tends to diminish somewhat as the distension increases and as the absorption of toxins diminishes the neuro muscular reflex activity In such cases the history, and possibly the character, of the vomit may serve to differentiate

Ectopic gestation

Rupture of an ectopic gestation, leading to severe intra peritoneal hæmorrhage, may cause syncope and collapse vomiting and severe abdominal pain A history of menstrual irregularity may be obtained but one must not rely on that for diagnosis The main points in diagnosis are the blanching of the lips, tongue nails and sclerotics and the absence of true abdominal rigidity, though the abdomen is generally tender and tumid especially in the lower part In both cases there will be some tenderness on digital rectal or vaginal examination No definite pelvic swelling can be made out in most cases of recent rupture of an ectopic gestation Free fluid in the abdomen may be detectable in both conditions and resonance over the *front* of the liver may be obtainable sometimes with a ruptured ectopic gestation (due to intestine pushed up by clots of blood) but resonance over the lateral aspect of the liver is only obtained with a perforated ulcer Pain over the clavicles or in the supra spinous fossa is sometimes a complaint in cases of ruptured extra uterine gestation as with perforated ulcer This is due to diaphragmatic irritation by the clotted blood in the upper abdomen

Peritonitis from other causes

Other forms of peritonitis can only be distinguished from that due to a perforated ulcer by considering the history of onset, and by determining the presence or absence of gas on the lateral aspect of the liver It may be impossible to differentiate from the results of perforation of some other part of the gut Peritonitis due to rupture of the gall bladder may be accompanied by an icteric tinge in the conjunctivæ

RUPTURE OF AN ULCER WITH FORMATION OF LOCALIZED SUBPHRENIC ABSCESS

When from one reason or another—previous adhesions slow leakage allowing time for deposit of fibrin—the escaping gastric contents do not flood the peritoneal cavity the symptoms are correspondingly modified The pain may be very great but the initial collapse is not so prostrating and the abdominal signs will soon localize themselves to the upper segment of the abdomen and lead to the development of a subphrenic abscess containing gas If such an abscess develops anteriorly, the local signs of intra peritoneal suppuration are very evident, but when the mischief is high up under the diaphragm the signs and symptoms take longer to develop Irregular temperature rigors, leucocytosis and dullness at the base of the lung consequent on pleural effusion or basal congestion will lead the observer to diagnose a collection of pus under the diaphragm A full description of subphrenic abscess does not come within the scope of this book

It must be remembered that occasionally a duodenal or pyloric ulcer may perforate, but the perforation may soon be sealed by a fibrin deposit Such cases give rise to pain rigidity, and tenderness in the right hypochondrium closely simulating the symptoms of acute cholecystitis and the condition may clear up without the formation of abscess

Frank perforation of an ulcer into the lesser sac of peritoneum is not common Usually adhesion takes place to the posterior wall of the sac and the ulcer simply erodes into the pancreas When, however, frank perforation does take place, there is initial acute pain in the upper abdomen, but rigidity of the upper abdomen does not result unless the fluid escapes from the foramen of Winslow into the general peritoneal cavity An abscess in the lesser sac is likely to follow giving rise to fever and the usual signs of suppuration and forming one type of subphrenic abscess

ACUTE PANCREATITIS

Acute pancreatitis accounts for less than 1 per cent of the cases of acute abdominal disease and must therefore be regarded as a comparatively rare disease It must be exceptional for any one surgeon to see more than two or three dozen cases in the course of his career so that dogmatic views based on personal experience alone must be (as in this case they are) supplemented and corrected by careful study of the experience of others

It has been stated that the common failure to diagnose acute

come late for diagnosis Acute strangulation of a coil of small bowel is the most likely type to cause difficulty In both conditions the onset may be with acute symptoms of collapse pain and vomiting and in both there may be evidence of free fluid in the abdomen but in obstruction the abdominal wall is usually flaccid and quite unlike the rigid board like condition in perforated ulcer In acute obstruction vomiting is almost from the first a distinctive feature, and the character of the vomit gradually changes until it is fæculent

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Pain over the clavicles or in the supra spinous fossa is sometimes a complaint in cases of ruptured extra uterine gestation as with perforated ulcer This is due to diaphragmatic irritation by the clotted blood in the upper abdomen

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RUPTURE OF AN ULCER WITH FORMATION OF LOCALIZED SUBPHRENIC ABSCESS

When from one reason or another—previous adhesions slow leakage allowing time for deposit of fibrin—the escaping gastric contents do not flood the peritoneal cavity, the symptoms are correspondingly modified The pain may be very great but the initial collapse is not so prostrating and the abdominal signs will soon localize themselves to the upper segment of the abdomen and lead to the development of a subphrenic abscess containing gas If such an abscess develops anteriorly the local signs of intra peritoneal suppuration are very evident but when the mischief is high up under the diaphragm the signs and symptoms take longer to develop Irregular temperature rigors leucocytosis and dullness at the base of the lung consequent on pleural effusion or basal congestion will lead the observer to diagnose a collection of pus under the diaphragm A full description of subphrenic abscess does not come within the scope of this book

It must be remembered that occasionally a duodenal or pyloric ulcer may perforate but the perforation may soon be sealed by a fibrin deposit Such cases give rise to pain rigidity and tenderness in the right hypochondrium closely simulating the symptoms of acute cholecystitis and the condition may clear up without the formation of abscess

Frank perforation of an ulcer into the lesser sac of peritoneum is not common Usually adhesion takes place to the posterior wall of the sac and the ulcer simply erodes into the pancreas When however frank perforation does take place there is initial acute pain in the upper abdomen but rigidity of the upper abdomen does not result unless the fluid escapes from the foramen of Winslow into the general peritoneal cavity An abscess in the lesser sac is likely to follow giving rise to fever and the usual signs of suppuration and forming one type of subphrenic abscess

ACUTE PANCREATITIS

Acute pancreatitis accounts for less than 1 per cent of the cases of acute abdominal disease and must therefore be regarded as a comparatively rare disease It must be exceptional for any one surgeon to see more than two or three dozen cases in the course of his career so that dogmatic views based on personal experience alone must be (as in this case they are) supplemented and corrected by careful study of the experience of others

It has been stated that the common failure to diagnose acute

pancreatitis correctly is due to neglect to consider its possibility in the individual case, but even when the condition is thoroughly considered and discussed a mistaken diagnosis frequently results Probably less than half the cases are correctly diagnosed before operation A special consideration of the symptoms is therefore all the more necessary

To understand and remember the symptoms one should recollect the anatomy of the pancreas and the pathology of the disease The gland lies in the retro peritoneal tissues in close relationship with the cœliac plexus and the semilunar ganglia The head is surrounded by and slightly overlaps the duodenum, the body lies in front of the first lumbar vertebra whilst the tail reaches the left loin and lies against the hilum of the spleen There are still many points in the pathology of pancreatitis which are not settled but there is a preponderance of evidence to show that the acute forms of inflammation are almost always due to infection which leads to severe and widespread hæmorrhage into the gland with subsequent disorganization of its substance and liberation and activation of its ferments If the patient lives long enough a part or the whole of the pancreas may become gangrenous

Acute pancreatitis seldom occurs before the age of forty, and is more common in stout people, it may or may not be associated with gall stones and the stopping up of the ampulla of Vater by a stone which may divert the bile along the pancreatic duct, is an uncommon accompaniment of the disease

SYMPTOMS

The symptoms of acute pancreatitis are rather variable—a fact which explains the conflicting accounts of the disease published by individual observers The one or two pathognomonic symptoms are rarely present and the more constant features must be carefully considered together before a diagnosis can be determined It is better to group the manifestations according to their cause

Symptoms due to inflammatory tension of the gland

PAIN —Though there may have been slight attacks of pain prior to the main attack the acute onset is usually dramatically sudden and fainting may occur The pain is excruciating and the patient will cry out in agony It is felt in the epigastric zone and *in one or both loins* The position of the gland accounts for the loin pain and the neighbourhood of the cœliac plexus explains its severity Sometimes pain is felt in the left scapular region and occasionally in the left supraspinous fossa (phrenic pain) Later on the intensity of the pain diminishes but it may be felt over the whole abdomen or perhaps more *in the right iliac fossa*

SHOCK —Profound shock usually accompanies the pain The cold extremities sweating skin, weak pulse and subnormal temperature sufficiently witness to the severity of the shock The thermometer may register as low as 95° F The pulse is usually rapid and weak, but I have known it slow and full even in the early stage of an attack, when the other symptoms of shock were very evident

VOMITING —Reflex vomiting or retching nearly always occurs Sometimes the retching is incessant but as a rule very little material is brought up The vomiting is more persistent than with a perforated ulcer Occasionally no nausea is felt In true reflex vomiting the vomit is never fæculent

TENDERNESS —Local epigastric tenderness is a constant finding

RIGIDITY —Epigastric rigidity is by no means constant It is true that soon after the onset there may be board like rigidity of the epigastric muscles *but* when the patient is examined there is *often a lax abdominal wall* Of sixteen cases recorded by Waring and Griffith thirteen had a soft abdominal wall This point should be emphasized since extreme muscular rigidity was at one time thought to be characteristic

Symptoms due to swelling of the pancreas

EPIGASTRIC TUMOUR —Sometimes the pancreas may be palpable as a transversely placed tumour in the epigastrium The fact that the patients are usually very stout and the occasional presence of rigidity often make the detection of the tumour difficult

JAUNDICE —Slight jaundice is found in about half the cases Since frequently, if not usually there are no obstructing gall stones the most reasonable explanation for the jaundice is that the common duct is compressed by the swollen head of the pancreas The common duct is normally surrounded by the head of the gland in two out of three cases

OBSTRUCTIVE VOMITING —True obstructive vomiting of fæculent or bilious material is very rare, but I have personal knowledge of one such case At the operation the swollen pancreatic head was definitely obstructing the duodenum This type of vomit must be distinguished from the more common reflex vomiting mentioned above

Symptoms due to extravasation of blood

ECCHYMOSIS —In hæmorrhagic pancreatitis some of the blood may find its way along the tissue planes and become evident as a dirty green or greenish yellow area in one or both loins This was first noted by Grey Turner who also, in one patient saw a similar

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discoloration around the navel This symptom when found is pathognomonic but it never occurs till two or three days after the onset of the disease

Symptoms due to deranged gland function

GLYCOSURIA —This is occasionally found, and in any case of acute abdominal pain should raise the question of pancreatic disease

INCREASE IN THE URINARY DIASTASE —The liberation of the pancreatic ferments leads to an increase in the amount of diastase in the urine Normally the urine contains about 10 to 20 units of diastase, but in acute pancreatitis this may be increased to 100 or 200 units Facilities for this test are, however, not always handy, and it is not always reliable

Other symptoms

CYANOSIS —This symptom has been noted in a considerable number of cases It is best observed in the face and extremities, but has sometimes been present in the skin of the abdomen

DYSPNŒA —This is occasionally noticeable It is reasonable to suppose that a partial inhibition of the diaphragmatic movements owing to the contiguous inflammation, may account, at any rate in part, for the cyanosis and dyspnœa

LOEWI S TEST —Loewi's test or adrenaline mydriasis is sometimes positive A drop or two of a 1 in 1,000 adrenaline hydrochloride solution is dropped into one conjunctival sac and the procedure repeated in five minutes Within half an hour the pupil on the tested side only should dilate if the test is positive The test indicates disturbance of the suprarenals by contiguous disease and is found occasionally in acute pancreatitis, but it has been known to be positive in cases of hyperthyroidism Very rarely indeed subcutaneous areas of fat necrosis may develop Ivor Lewis has recorded such a case

It should be remembered that in the later stages of acute pancreatitis a more general abdominal condition results, blood stained fluid collects in the peritoneal cavity distension supervenes, and there may be irregular fever It is very difficult to diagnose such cases without a very accurate previous history of the case Albuminuria is common (Wapshaw, 1957)

DIAGNOSIS

Acute pancreatitis is most commonly mistaken for a *perforated gastric or duodenal ulcer* The less acute cases may be misdiagnosed *appendicitis*, whilst those cases with distension may easily be regarded as examples of *intestinal obstruction* *Acute cholecystitis* and *biliary colic* may also simulate the symptoms of pancreatitis

With a perforated ulcer general abdominal rigidity is constant in the early stages after perforation, whilst in pancreatitis the abdomen may be softer and any rigidity is usually limited to the epigastric zone In his original paper, Fitz very accurately wrote that the symptoms of acute pancreatitis were those of an *epigastric* peritonitis In a case of perforated ulcer the symptoms are usually more widespread Pain on top of the shoulder is frequently felt when an ulcer perforates with pancreatitis such pain is rare and when present is felt on top of the left shoulder Bilateral lumbar pain cyanosis, and slight jaundice would be in favour of pancreatitis, whilst absence of liver dullness in the axillary line would definitely indicate perforated ulcer Glycosuria a positive Loewi test or (when the test can be made) a great increase in the diastase content of the urine would point to pancreatitis

Appendicitis is generally distinguishable if careful attention be paid to the history of onset and the order of symptoms The vomiting and pain are both less severe in appendicitis and there may be definite local symptoms in the right iliac fossa With acute cholecystitis and biliary colic tenderness is felt more in the right hypochondrium and there may be a definite history of previous attacks whilst hyperæsthesia to pin-stroke in the superficial distribution of the 8th or 9th thoracic nerves may point to gall bladder trouble The tests of glandular derangement may help to determine but it must be remembered that cholecystitis and pancreatitis may co-exist

When distension has supervened it is difficult to distinguish from the late stages of peritonitis and intestinal obstruction unless positive tests of deranged gland function and a very clear history point to the correct diagnosis

With every care in investigation acute pancrealitis is frequently only diagnosed with certainty when the abdomen is opened and blood stained fluid and areas of fat necrosis are seen

VIII

ACUTE INTESTINAL OBSTRUCTION

ACUTE OBSTRUCTION of the intestine in the form of strangulated hernia was one of the first of the abdominal emergencies to be referred to the surgeon for treatment, whilst obstruction accompanied by similar symptoms but due to internal causes which were not so obvious as an external hernial swelling was amongst the latest of the urgent abdominal cases to be given up by the physician to the surgeon Medical treatment was, not so long ago, recommended to be tried as a first resort, and only when a course of treatment by aperients and enemas failed to relieve was the operating colleague called in to see the patient If there be any condition in which early diagnosis and operative treatment, and avoidance of attempts at purgation, are necessary, it is intestinal obstruction For a patient to be allowed to continue in violent pain and to vomit repeatedly whilst the abdomen gradually becomes distended, is unfair not only to the patient but also to the surgeon who may have to operate in conditions made so much worse by delay

The pathology and causation of acute intestinal obstruction are far too big questions to discuss fully in a small book We are here concerned only with the common causes and the main types of cases which come for diagnosis It is not always essential in diagnosis to know the exact cause of the obstruction though every effort should be made to ascertain it as accurately as possible It is useful to have a knowledge of the proportion of cases due to the main pathological causes of obstruction In a consecutive series of 301 cases of intestinal obstruction at St Mary's Hospital, 177 were due to strangulated hernia and 124 to all other causes combined

Much the same proportion is shown in an analysis (by the Association of Surgeons) of a much larger series, consisting of 6 892 cases of acute intestinal obstruction

Cause	*Number of Cases*
External hernia	3,267
External constriction	1,324
Intussusception	1 034
Internal constriction	971
Volvulus	176
Internal obturation	71
Embolism and thrombosis	49

It is a mistake to treat strangulated external hernia in a different category from obstruction in which no external cause is to be found Strangulated hernia is the most common form of intestinal obstruction and is responsible for many more deaths than any other single cause of that condition (see Chapter I) Apart from strangulated external hernia there are only three *common* forms of intestinal obstruction—intussusception carcinoma of the large bowel and obstruction by adhesions or bands Volvulus gall stone obstruction, fibrous and tuberculous stricture of the gut and all the rarer causes are responsible for only about 15 per cent of the cases The very rough generalization may be made that in infancy acute obstructive symptoms are usually due to intussusception in childhood, adolescence and early middle age to bands and adhesions and in later life to cancerous stricture of the large bowel Adhesions or bands attached to the region around a formerly inflamed appendix are responsible for many cases whilst a Meckel s diverticulum is in younger life responsible for some band-obstructions

When the bowel is completely obstructed the course of the disease is inevitably towards a fatal issue unless the obstruction be relieved either by

(i) The spontaneous rectification of the condition—which is almost unknown save in a few cases of reduction of an obstructed hernia and the occasional cure of an intussusception by the sloughing of the invaginated part,

(ii) Formation of an external fæcal fistula

(iii) Operative interference

The third method is nearly always advisable Until comparatively recently the mortality after operation in cases of intestinal obstruction (excluding strangulated external hernias) was well over 50 per cent and even now it is more than it should be because the patients are not operated upon early enough The main desideratum is to diagnose the cases early There are few cases of intestinal obstruction which could not be remedied or alleviated if brought to the surgeon within twelve hours of the onset of symptoms

Intestinal obstruction may exist in a chronic or subacute form for a considerable period before a really acute attack ensues In the chronic form the symptoms are similar in kind but different in degree from those resulting from an acute attack Chronic obstruction if uncorrected sooner or later terminates in an acute attack

SYMPTOMS

The symptoms of acute intestinal obstruction differ greatly according to the site of obstruction The higher up in the gut is the stop

page, the more severe are the symptoms It is usually possible to say approximately what part of the gut is obstructed, and cases may be divided roughly into three classes namely those due to obstruction of

1 Upper small gut
2 Lower small gut,
3 Large bowel

GENERAL SYMPTOMS OF ACUTE INTESTINAL OBSTRUCTION

Pain
Shock
Vomiting
Constipation (inability to pass fæces or flatus)
Distension
Tenderness of abdomen
Visible peristalsis

Pain

Pain is usually very severe from the onset It is referred to the epigastric and umbilical regions or sometimes to the hypogastrium and frequently comes on in bouts or spasms, though if a considerable segment of mesentery is implicated the pain may be continuous The spasmodic pain is due to the peristalsis of the intestine trying to overcome the obstruction This can easily be demonstrated during the examination of an intussusception when the soft tumour may be felt to harden just before the screaming of the infant The initial pain is similar to that caused by any severe stimulation of the abdominal sympathetic nerves and is often accompanied by those symptoms consequent on such stimulation and comprised under the term "shock "

Primary shock or collapse

In severe cases the pulse may be weak the skin cold and sweating the temperature subnormal and the pupils dilated but as a rule the symptoms are not so severe as this and in most cases of severe primary shock a reaction follows and the patient though still in pain appears and feels a little better

Vomiting

Vomiting is an almost constant feature but varies very greatly in the different forms The higher up the intestine the obstruction the sooner vomiting sets in and the more violent is the regurgitation In obstruction of the large bowel vomiting may be absent but nausea is constant In obstructive vomiting, first the stomach contents are expelled then green bilious material appears and if the obstruction be some way down the small intestine the colour of the vomit changes

to yellow or greenish brown and becomes fæculent A fæculent vomit, in the absence of peritonitis is diagnostic of intestinal obstruction, though it should be regarded as a late symptom of that condition The nature of the vomit is therefore to be watched very carefully and the vomited material should never be thrown away till seen by the medical attendant True fæcal vomit is only seen when a communication exists between the colon and stomach

Constipation

Constipation is one of the symptoms of intestinal obstruction, but it is not always evident at first If the bowel be occluded at any spot it is clear that no contents can pass the occluded area, but the gut below the stoppage can empty it elf, so that for a time motions may be passed So soon as the lower bowel is emptied (either naturally or by enemas) neither flatus nor fæces pass In doubtful or subacute cases the plan of giving two turpentine enemas with an interval of a few hours (as suggested by Barnard) is good The first empties the lower bowel and the second proves or dis proves the existence of obstruction But it is conceivable that both enemas might bring a return of fæcal material and yet obstruction exist In very acute cases the shock is so great that the gut may be too paralysed to allow any natural movement of the bowels though an enema may evacuate fæcal contents There are many acute cases in which constipation should be regarded as a sequel rather than a symptom for valuable time may be lost in the attempt either to open the bowels or prove that the ob struction exists *If the other symptoms of intestinal obstruction are present it is unwise to wait twelve or twenty four hours to demonstrate constipation* It is advisable to point out that in acute intussuscep tion there is occasionally incomplete obstruction so that some brown or yellowish fæcal material may come away in addition to the blood and mucus

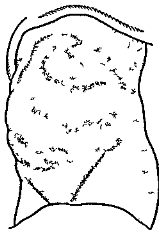


FIG 22 —Drawing to show ladder pattern of abdominal dis tension (indicating obstruction of the lower ileum)

Distension

Distension is usually late in appearing in the acute cases *or in those*

in which the upper part of the small intestine is affected But always sooner or later it is in evidence In obstruction of the large bowel and lower end of the small bowel it may be apparent by the time the symptoms become acute enough to call the serious attention of the patient It is indeed because of the relative slightness of the pain and vomiting that the distension in these cases is allowed to proceed so far

Distension at first may be merely local, owing to the dilatation of the coils of gut immediately above the obstruction In some cases where ordinary clinical examination does not show any definite distension a radiograph may reveal local distension of the intestine In obstruction of the end of the ileum a local hypogastric distension may first be observed, and in volvulus of the sigmoid the outline of the affected coil of large bowel may stand out very distinctly In subacute or partial obstruction of the lower end of the small bowel the distension gradually affects coil after coil so that when the patient comes under observation with acute symptoms the typical ladder pattern type of distension is seen on looking at the abdomen (Fig 22)

Tenderness

Tenderness of the abdomen is not usually found till distension appears Pressure over a distended coil is generally painful In the later stages of obstruction when peritonitis has ensued there may be general pain all over the abdomen *Rigidity* of the abdominal wall is unusual save in those cases where there is some local peritonitis round the obstructed or strangulated section of bowel

Peristalsis

Visible peristalsis is not a constant accompaniment of obstruction but is diagnostic when present, except in some few very thin persons in whom the normal peristaltic movements of the intestines can be seen through the abdominal wall It is not usually seen in the very acute cases of strangulation, but in subacute obstruction it is more frequently noted and is very valuable in diagnosis In some instances peristalsis may be accompanied by a gurgling of gas which may occasionally be heard to pass through a narrowed part of the gut If a stethoscope is applied to the abdomen during a bout of pain it may be possible to hear sounds caused by fluid passing through the site of obstruction under the pressure caused by the peristaltic wave

SYMPTOMS DUE TO DIFFERENT TYPES OF OBSTRUCTION

The features of an attack of obstruction vary according to 1, the

part of gut obstructed, 2 whether or not the mesentery with the contained blood vessels is also affected and 3 the completeness or otherwise of the obstruction

The part of the gut obstructed

The symptoms due to obstruction—(*a*) high up in the small intestine (*b*) low down in the small intestine, and (*c*) in the large bowel—can be roughly differentiated

(*a*) OBSTRUCTION HIGH UP IN THE SMALL INTESTINE This leads to acute symptoms, vomiting comes on very early and is frequent and violent initial shock and pain are greater, and distension is not an early feature The vomit is green and bilious Such symptoms are typically seen when a large gall stone ulcerates into the duodenum Obstruction of the duodenum by a cicatrized ulcer may sometimes be acute owing to sudden spasm and œdema round the ulcer In such cases everything taken by mouth is returned, but no fæculent vomit occurs and sometimes peristalsis of the stomach may be seen The same symptoms are seen in infants suffering from congenital hypertrophic pyloric stenosis Distension is seen only in the epigastric region

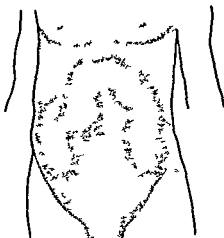


FIG 23—Diagram to show appearance of moderate distension of the large gut

With obstruction of the upper jejunum the symptoms are still very acute and the vomiting begins early and is frequently repeated while distension is not at first a noticeable feature unless there be a strangulation of a large coil of gut The farther down the jejunum the obstruction the less acute the symptoms

(*b*) IN OBSTRUCTION OF THE LOWER PART OF THE SMALL INTESTINE—The symptoms are less severe than those just summarized Shock and pain may be great but vomiting is usually a little later in onset and some time elapses before fæculent vomit occurs Distension comes on after a few hours In subacute cases the ladder pattern of distension is seen and peristalsis is often visible It was pointed out by John Hilton more than a hundred years ago that when there is obstruction in the lower ileum considerable fluid is still absorbed

from the bowel and the secretion of urine is only slightly diminished With upper jejunal obstruction there is a great diminution of the amount of urine secreted

(c) IN LARGE BOWEL OBSTRUCTION —Pain is much less acute shock is comparatively insignificant (except in some cases of volvulus and intussusception) vomiting is a fairly late and infrequent symptom, whilst distension almost from the onset of the acute attack is the rule An exception must be made in the case of intussusception for in these cases distension is not an early symptom and should not be waited for, since a distended abdomen accompanying an intussusception generally means that the chance of recovery is slight

Compression of the blood vessels Strangulation of bowel

When the vessels in the mesentery of a coil of gut are compressed first the veins and later the arteries become occluded There is in fact a strangulation of the coil and the gut soon becomes gangrenous This *strangulation* of the coil of gut adds greatly to the immediate danger, for not only is the obstruction complete but local peritonitis develops rapidly and unless the condition be soon relieved perforation of the bowel will occur and cause a fatal general peritonitis This condition is commonly brought about by bands by external or internal hernia or by volvulus The onset of symptoms is usually sudden accompanied by collapse or severe shock great pain and early vomiting If the gut is completely within the abdomen the local peritonitis will tend to become more general, and by the time the case comes to the surgeon *there may therefore be definite abdominal rigidity over the affected part of the abdomen*

The extent of the obstruction

The symptoms of obstruction vary greatly with the degree of occlusion of the lumen of the gut When the obstruction is partial or if the muscular contractions can to any extent force the contents past the obstructed part, the symptoms are less severe This may result from a kinking of the gut due to adhesions between the bowel and a calcified gland the abdominal wall another viscus or a tumour In these cases the onset is more insidious the pain is not so severe and may have intervals of intermission the vomiting may for a day or two be slight in degree and distension comes on but gradually Quite commonly such cases do not come to the surgeon until fæculent vomit has appeared In these cases the abdominal wall is quite flaccid since peritonitis is absent for the gut remains intact and its blood supply in the mesentery is unimpaired This type is the variety which may occur after abdominal operations when a certain amount of pain



(*a*)

Obstruction of the colon The cæcum ascending colon and descending colon are distended but the distension stops abruptly in the region of the left iliac fossa where the iliac colon was obstructed by a carcinoma



(*b*)

A case of *early* acute obstruction of the ileum by a band Localized gas and fluid levels showed need for operation



(*a*)



(*b*)

Obstruction of ileum by adhesion one year after abdomino perineal excision of rectum for carcinoma (*a*) Patient erect (*b*) Patient supine



(*c*) Volvulus of sigmoid colon

vomiting and distension is not unusual There is therefore all the greater need to watch such cases carefully

In the gradual narrowing of the gut lumen due to stricture sub acute volvulus or chronic intussusception and in cases where only a part of the lumen of the bowel is nipped in a hernial aperture (Richter s hernia) the onset of symptoms is still more gradual, vomiting is less and the pain is intermittent

A Richter s hernia of the cæcum (of which one instance has occurred in the author s practice) may be unaccompanied by any obstruction of the bowel and the herniated part of the gut wall may become gan grenous without giving rise to any acute symptoms

When omentum only is strangulated there are subacute symptoms of obstruction pain vomiting and some distension but the vomiting never becomes fæculent and the ob truction is never complete—for flatus and fæces are brought away by enemas The general symptoms in omental strangulation are usually slight but if a large mass becomes gangrenous (e g in an umbilical hernia) serious symptoms and even death may result

DIAGNOSIS

DIAGNOSIS OF OBSTRUCTION OF SMALL INTESTINE

When a patient is seized with acute abdominal pain becomes collapsed with feeble pulse cold extremities anxious look and sweating skin and soon begins to vomit first the stomach contents then bile then yellowish material which becomes brownish and fæculent smelling while the abdomen remains flaccid flat and not tender that patient is suffering from acute obstruction of the small intestine The diagnosis should be made without waiting for distension to appear nor—if the above symptoms are present—is there any need to demonstrate constipation If the symptoms are not so acute there will be additional signs for there is an inverse proportion between the acuteness of the symptoms and the probability of the presence of signs The higher up the gut the obstruction the more frequent the pains Dennis noted that attacks of pain came on every 3 to 5 minutes in the upper ileum and every 6 to 10 minutes in the lower ileum When pain and vomiting and shock are slight, distension and visible peristalsis are more likely to be seen, and constipation tested by two turpentine enemas can usually be demonstrated Thus it is that when acute supervenes upon chronic obstruction both symptoms and signs are in evidence

DIFFERENTIAL DIAGNOSIS OF ACUTE OBSTRUCTION OF THE SMALL INTESTINE

Diagnosis must be considered either before distension has devel

oped or after that sign has appeared Always remember that half the cases of acute obstruction are due to strangulated hernias and therefore *always examine first all the hernial orifices*

Distension absent

When no distension is present acute obstruction has to be distinguished from all the other acute abdominal catastrophes The pain is often characteristic in type, occurring in bouts of acute intensity during which the severity is indicated by the patient s drawn features, it is usually central in position except in those cases in which a coil is strangled, when the pain will be referred to the site of strangulation Sometimes borborygmi may be heard passing along the bowel During the intervals between the bouts the patient's face shows apprehension of the return of the pain From the acute inflammations—perforated gastric ulcer, pancreatitis, appendicitis with peritonitis, cholecystitis—it is distinguished by the absence of rigidity and by the more frequent vomiting *which tends to become fæculent* Renal and biliary colic are distinguished by the location and radiation of the pain and the absence of fæculent vomit Neither stoppage of the bowel contents nor distension follows the colics In torsion of a viscus (ovarian cyst testicle) the vomiting does not become fæculent Gastric crisis is excluded by finding no other sign of tabes It is usually sufficient to test the knee jerks and the pupillary reactions

In many cases in which the diagnosis of obstruction of the small intestine is in question great help may be obtained from a study of a plain X ray of the abdomen Normally little or no gas or fluid can be *seen in the regions of the abdomen occupied by small gut* When there is obstruction however, the contents are dammed back and a plain radiograph will often show small collections of gas each lying on top of a minute pool of liquid whose fluid level is characteristic This aid is particularly helpful in the early stages of obstruction of the upper jejunum when no distension is likely to be present (See Plates 2 3 5 6)

VOLVULUS OF THE STOMACH —In considering the diagnosis of obstruction in the upper part of the small gut one must exclude volvulus of the stomach a rare but well recognized condition

Acute volvulus of the stomach occurs chiefly in older people It gives rise to violent and repeated vomiting followed (after the stomach is empty) by continuous retching The vomit contains no bile The epigastrium becomes distended but the lower abdomen remains *empty and retracted* *Maingot makes the useful comment* that a stomach tube cannot be passed into the stomach Symptoms of collapse ensue if the condition is not remedied by operation

Distension present

When distension is present one must consider the question of uræmia mesenteric thrombosis or embolism or the late stage of peritonitis due to any cause

URÆMIA should be diagnosed by careful consideration of the history, by examination of the urine for albumin, and maybe by detecting enlargement of the kidneys Sometimes in uræmic patients there may be a mere trace of albumin in the urine but a low specific gravity would make one suspicious and examination of the heart and determination of the blood pressure might throw light on the case

ACUTE BLOCKAGE OF THE MESENTERIC ARTERIES or veins by an embolus or thrombus may lead to symptoms indistinguishable from those due to internal strangulation In both cases the vascular disturbance leads rapidly to serious changes in the bowel With primary mesenteric thrombosis the extent of gut affected is likely to be greater and distension of the abdomen appears more rapidly Sometimes a palpable mass is formed by the affected coil or gut A history of recent endocarditis might point to a possible embolism, whilst hepatic disease or previous thrombotic trouble would sometimes suggest the possibility of mesenteric thrombosis Though there is no mechanical obstruction in the intestines in a case of vascular occlusion the affected gut soon becomes paralysed and hæmorrhagic, and the blood which is almost always poured into the bowel lumen as a consequence of the infarction sometimes passes into the gut farther on and can be demonstrated by the administration of an enema (Cokkinis) (See also Chapter XII)

Unless promptly dealt with mesenteric thrombosis is soon followed by peritonitis

It may be impossible to distinguish between a late case of intestinal obstruction and late peritonitis unless the history gives some indication In late peritonitis there is usually paralytic intestinal obstruction, whilst in the late stages of mechanical obstruction there is frequently peritonitis In peritonitis however the vomit is seldom so definitely fæculent as in late mechanical obstruction

OBSTRUCTION OF THE SMALL INTESTINE BY A GALL STONE This can sometimes be distinguished by certain features first *described by* Barnard

A gall stone which causes obstruction generally ulcerates into the duodenum, causing the symptoms of very acute obstruction i e severe pain and frequent vomiting of everything taken into the stomach The vomit may contain blood from the ulcerated opening and this may lead to an erroneous diagnosis of gastric ulcer The stone passes on gradually and the symptoms abate considerably but in a

day or two it stops again at the lower end of the ileum (which is the narrowest part of the small intestine) and the symptoms recur Therefore if one is faced with a case showing symptoms of obstruction of the *upper* small gut in which these symptoms subside but are followed in a day or two by those suggestive of obstruction of the *lower* small gut the cause is likely to be a gall stone This is the more likely if there has been a history suggestive of gall stones or if the patient is a fat woman of middle or advanced age Occlusion of the small intestine by a gall stone is the only type of obstruction in which I have seen fæculent vomiting come on very early and persist (with diminishing frequency) without any serious collapse or abdominal distension supervening What little distension develops may be concealed by a fat abdominal wall so that the abdomen may actually appear normal The character of the vomit remains fæculent, though there may be longer intervals between the bouts of pain and vomiting Considerable distension may develop towards the end of the case The above characters make gall stone obstruction of the small intestine more easy to diagnose than would be considered likely from the rarity of the condition Some of these large gall stones contain material opaque to X rays, and a plain X ray of the abdomen will then show the stone in the intestine and guide one as to the best place for the incision If the radiograph should give evidence of air in the biliary passages the observer would be justified in considering gall stone ileus as the probable cause of the symptoms In one case under my care it al o showed other large stones in the gall bladder, which in due course were passed along the intestine and evacuated per anum

DIAGNOSIS OF OBSTRUCTION OF THE LARGE INTESTINE

Obstruction of the large bowel is commonly due to one of three conditions—stricture intussusception, or volvulus The stricture is usually of a cancerous nature but may result more rarely from diverticulitis or pressure of fibrous tissue external to the gut Each of these three conditions must be considered separately We shall not consider separately those cases of obstruction of the large gut by pelvic tumours since the primary condition is usually evident

INTESTINAL OBSTRUCTION IN INFANTS

Intestinal obstruction in infants and young children is always serious and usually dangerous

New born babes may have complete obliteration of the lumen of

some part of the small or large intestine or they may present obstruction due to malrotation of the intestinal loop

The obstruction may be in the duodenum, jejunum ileum or in the large bowel Sometimes there is not a complete obstruction but a narrowing or stenosis, in these cases the symptoms will be more gradual in onset

If the obstruction be in the duodenum or upper ileum, the symptoms begin within forty-eight hours of birth by the onset of vomiting, which continues and becomes persistent The vomit usually contains bile All the liquid food taken by mouth is quickly returned and the stomach and upper duodenum becomes distended and cause a fullness in the epigastrium The lower abdomen is normal There may be visible gastric peristalsis The babe is apathetic does not show any desire to take anything by mouth and rapidly wastes away and becomes dehydrated A straight X ray will show much gas in the stomach and duodenum but not beyond The clinical picture and the characteristic X ray picture usually make diagnosis fairly clear (See Plate 8a)

When the obstruction is lower down the intestine in the ileum, the symptoms come on more slowly but quite definitely The coils of intestine will gradually distend and may give a ladder pattern The vomiting which comes on several days after birth will change from bilious to brownish and will have a fæculent odour An X ray will show coils of distended small bowel but will show no gas in the colon

An imperforate anus is usually noted at birth but if there be an occlusion of the colon higher up several days may pass before serious symptoms may present themselves The gradually increasing abdominal distension and perhaps the onset of vomiting will cause alarm and the absence of normal stools will certainly cause further investigation to be made

In atresia of the small or large gut stools may be passed which though not normal may not at once call attention to the serious abnormality Fortunately there is a simple test which will determine whether or not there is a complete obstruction The intestine of all new born babes contains some vernix caseosa which has been swallowed This should appear in the stools if no obstruction be present The presence of the cornified cells of the vernix caseosa can be identified readily by Farber s test A smear of the contents of the bowel is made on a glass slide and is stained with Stirling s gentian violet, the slide is then washed with running water and decolorized with acid alcohol The cornified cells of the vernix retain the stain and can easily be recognized

MECONIUM ILEUS

Meconium ileus is a form of intestinal obstruction which, until comparatively recently, was almost invariably fatal, during the last fifteen years, however, a method of treatment has been evolved which saves the lives of a number of these patients

Meconium ileus is a condition usually associated with fibrocystic disease of the pancreas, in which the meconium in the lower part of the intestine becomes inspissated to such an extent that the lumen of the bowel is completely occluded The meconium is thick and sticky, and cannot easily be shifted along the bowel Gross states that "commonly it is found plugging the last 10, 20 or even 30 cm of ileum which is considerably dilated and greatly thickened" Vomiting starts a day or two after birth and there is moderate distension An infant with meconium ileus also has pancreatic disease and the vomit brought up is deficient in trypsin The presence or absence of trypsin may be tested in a simple way by a method suggested by Jolleys

A small piece of exposed X ray film is dropped into some of the vomit If trypsin be present, all the gelatine on the film will be dissolved off within an hour If trypsin be absent this does not take place The stools may not give much definite information, but a straight X ray will show the coils of intestine to vary greatly in size Gross asserts that inspissated meconium sometimes shows a granular appearance (in a radiograph) which is never seen in other forms of obstruction and he gives the welcome information that after trying many forms of unsuccessful surgical treatment, it has been found possible to save a considerable proportion of these patients by resecting the involved part of intestine by a Mikulicz operation with the formation of a double ileostomy and a later crushing of the spur Treatment of the pancreatic deficiency has to be continued afterwards (See Plate 8c)

HYPERTROPHIC PYLORIC STENOSIS

This is an emergency which usually arises in the second month of life The symptoms begin about the sixth week after birth with vomiting which gradually becomes persistent The vomit does not as a rule contain any bile Gastric peristalsis may be seen and sometimes a small tumour may be felt in the upper abdomen lying under the liver in the right hypochondrium or epigastrium The symptoms are usually sufficiently characteristic to make diagnosis straightforward

Intussusception and strangulated hernia are dealt with in other parts of this book

IX

INTUSSUSCEPTION

INTUSSUSCEPTION OR invagination of the intestine is the most common abdominal emergency in children under two years It con stitutes 15 per cent of all cases of intestinal obstruction It is much less common in later childhood and adult life only 30 per cent of cases occurring after the second year of life The catastrophe is all the more unexpected in that it usually attacks the most healthy looking and well nourished babies The condition consists in the invagination of one portion of intestine into the portion next to it Commonly if not invariably, the invaginated part (intussusceptum) enters the part below (intussuscipiens) Clearly the most anatomically favourable part for such an occurrence is in the ileo cæcal region where the narrow ileum can readily enter the lax cæcum and in actual clinical experience this is the most common place for the condition to start (Fig 24) There are three varieties of intussusception—enteric entero colic and colic Enteric where the small intestine alone is involved is uncom mon colic in which the colon alone is affected is less rare but not very common, entero colic is the most common variety The entero colic type is subdivided into ileo cæcal in which the apex of the invaginated part is the ileo cæcal valve and ileo colic in which a part of the gut near the end of the ileum forms the advancing apex

In the case of the most common form—the entero colic—as the end of the ileum is invaginated into the colon a portion of the mesentery goes with it and constriction and later strangulation of the vessels occur causing œdema of the gut wall with intestinal hæmorrhage and finally gangrene The irritation caused by the intruded gut leads to an excessive secretion of mucus The part of the gut which first becomes invaginated remains at the apex of the advancing portion and it pro gresses at the expense of the ensheathing layer (intussuscipiens) The apex is sometimes extruded at the anus If left untreated intussuscep tion ends in one of two ways Most commonly the intestinal lumen is gradually occluded and acute intestinal obstruction and death from toxæmia or peritonitis result or more rarely the invaginated part becomes completely gangrenous and passes per anum as a large slough In pre operative days many such cases were recorded but since it was a comparative rarity for infants to recover from the condition such a fortunate event as a natural cure by gangrene of the intussuscepted part was usually recorded

The cause of intussusception appears to be the presence in the gut of something which provokes excessive peristalsis It commonly occurs in infants at the weaning time, when there are likely to be occasional portions of undigestible solid food taken by the well nourished baby

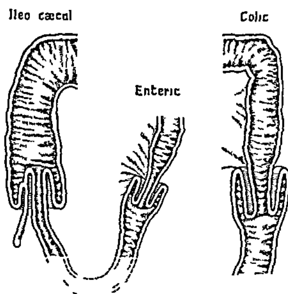


FIG 24—Types of intussusception (1) ileo cæcal (2) enteric (which is termed ileo-colic if it progress beyond the ileo-cæcal valve) (3) colic

In later life tumours of the gut wall are commonly the cause of the condition

SYMPTOMS

The symptoms of intussusception are usually characteristic They comprise a few or many of the following according to the stage at which the case is seen

1 Abdominal pain 2 Shock
3 Passage of blood and mucus per anum
4 Vomiting 5 An abdominal swelling
6 Visible peristalsis 7 Constipation
8 Absence of cæcum from the right iliac fossa
9 Tenesmus 10 Distension of abdomen
11 Appearance of apex of intussusception at anus
12 Peritonitis

ABDOMINAL PAIN —The onset is usually with a *fit of screaming*—the infant s method of indicating pain The legs are drawn up during the

screaming attacks The pain is very severe but is not continuous, and corresponds to the violent peristaltic contraction of the gut Between the bouts of pain the child may lie quiet, but often has an apprehensive look Less often the child does not scream or show any sign of abdominal pain other than pallor and drawing up of the legs or restlessly rolling over on the bed

SHOCK —The severity of the pain is shown by the *symptoms of shock* which accompany it The extreme facial pallor the dilated pupils and anxious appearance of the child are sufficiently demonstrative

BLOOD AND MUCUS —At a period varying according to the site of the invagination—later if it starts in the ileum earlier if in the transverse colon—*blood and mucus are passed per anum* This usually occurs within a few hours The blood is often quite slight in amount and it is seldom copious Slimy mucus is mixed with the blood and not infrequently some brown or yellow fæcal material may also be passed Cases do occur however in which no blood is passed per anum before the child comes under observation, sometimes up to as long as 24 or 48 hours after onset of the pain The practitioner must be prepared to diagnose intussusception before blood has been passed per anum

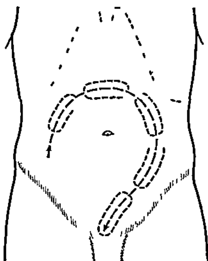


FIG 25 —Diagram to show the possible positions of abdominal tumour in cases of intussusception

VOMITING —This generally occurs but it is not severe at first It is never a serious feature until the late stages when complete obstruction has ensued or peritonitis developed The contents of the stomach are returned any liquid taken is not retained by the viscus and later there may be bilious vomit but fæculent vomit is rare

ABDOMINAL TUMOUR —By the time blood appears per anum *a tumour* will be present in the abdomen It is caused by the invaginated gut and is felt either in the right loin right hypochondrium epigastrium left hypochondrium left lumbar region or left iliac region according to the advance made by the intussusception through the colon The tumour is oval in shape and has often been compared—quite aptly—to a sausage Sometimes the swelling becomes harder

the change corresponding to the muscular peristaltic contraction Frequently it is easy to feel the swelling, but in many cases an an esthetic is necessary to relax the abdominal wall and even when the child is anæsthetized it may be difficult to identify an intussusception which lies under cover of the liver *The hiding of the intussusception by the overhanging liver is responsible for many failures to detect the tumour*

VISIBLE PERISTALSIS —Peristalsis may sometimes be seen through the abdominal wall, and the simultaneous hardening of the tumour has been referred to above

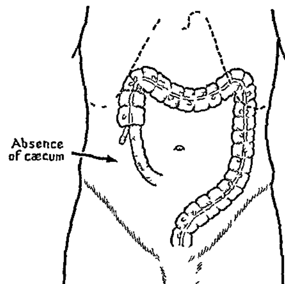


FIG 26 —Diagram to show how the cæcum is absent from the right iliac fossa in intussusception (This is a valuable diagnostic point in distinguishing it from colitis)

EMPTY RIGHT ILIAC FOSSA —In the common entero colic variety almost from the beginning of the illness *the right iliac fossa will appear empty on palpation*, owing to the taking up of the cæcum into the advancing invagination (Signe de Dance)

BOWELS —Constipation is by no means always absolute Exceptionally an intussusception may be present and yet the bowels may open fairly normally and not uncommonly fæcal material may be mingled with the blood and mucus which come away As the condition advances, however the obstruction increases and ultimately becomes absolute One must therefore be prepared sometimes to diagnose intussusception in the absence of absolute constipation

TENESMUS —As the intussusception approaches the rectum *tenesmus* may be indicated by the constant straining efforts of the infant At this stage the congested apex may sometimes be felt on rectal examination

DISTENSION —In late or neglected cases the increasing obstruction of the lumen of the gut results in *abdominal distension* and increased frequency of vomiting

PROTRUSION OF APEX —In some cases the *apex* of the intussusception *may protrude through the anus* as a red congested fleshy mass

OBSTRUCTION AND PERITONITIS —The final stage is that of complete intestinal obstruction and peritonitis due to gangrene of the devitalized gut and infection of the peritoneum Repeated vomiting signs of toxæmia and exhaustion end the scene

In addition to the above symptoms fever up to 100° F or even higher may be present as early as within the first 24 hours (Morrison and Court)

DIAGNOSIS

It is not usually difficult to diagnose an intussusception The age of the child the previous good health and sudden onset of acute pain coming on in bouts which cause severe temporary shock the passage of blood and mucus per anum and the presence of a sausage shaped swelling in the abdomen are sufficiently characteristic to admit of no doubt The cases of real doubt are those in which when the doctor sees the patient the attacks of pain may be quiescent and no tumour can be felt In such cases if the history is at all suggestive or characteristic and blood and mucus have been passed, an anæsthetic may be given in order to examine the abdomen carefully for a lump If an X ray apparatus is available it is better to give a barium enema and take photographs By this means the diagnosis can be definitely made, and at the same time the enema will help to reduce any intussusception which may be present (See Plate 7)

DIFFERENTIAL DIAGNOSIS

In the early stages the condition must be distinguished from

Simple colic Colitis Rectal polypus

In the later stages one must exclude

Prolapsed anus Other causes of obstruction and peritonitis
Henoch s purpura

Simple colic

With simple colic the evidence of pain is not so outstanding nor is shock so extreme No lump can be felt in the abdomen and no blood is passed per anum but instead undigested material may come away indicating a cause for the colic Pain ceases when the bowels are emptied of the undigested or irritating contents

Colitis and enterocolitis

These furnish the main difficulty in diagnosis in young infants

amongst whom acute colitis is not uncommon—especially in the autumn Colitis is frequently accompanied by the passage of blood and mucus per rectum The chief distinguishing features are as follows

1 In colitis there is usually a stage of preliminary diarrhœa un accompanied by blood

2 The infants who readily fall victims to colitis are more frequently ill nourished children Intussusception usually attacks well nourished fat infants

3 In colitis there are more frequent stools as a rule containing more fæcal material than in cases of intussusception

4 In colitis there is no abdominal tumour to be felt

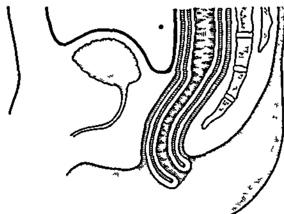


Fig 27 —Diagram of prolapsed intussusception

5 The cæcum can be felt in the right iliac fossa and possibly gurgling may be elicited by pressing on it There is not that emptiness which is so noticeable on palpating the fossa in most cases of intus susception

6 The crises of pain are not usually so severe in colitis

7 In colitis there will sometimes be tender ness along the whole course of the colon

Obstructive symptoms and distension are not so common in colitis Tenesmus may be present in both cases There may be an epidemic of similar cases which may help in the diagnosis of colitis As men tioned above a radiograph after giving a barium enema will always settle the diagnosis Two or three degrees of fever may be present in each condition so this symptom cannot be used as a differentiating help

Prolapsed anus

Cases in which the apex of the invagination protrudes through the anus have to be distinguished from *prolapsus ani* (Figs 27 and 28) In the latter there is a ring of prolapsed mucous membrane seen around a central opening and the finger or a probe cannot be in erted between the mucosa and the external sphincter in a prolapsed in tussusception the opening of the protruding portion is towards the

posterior aspect of the projection and the finger can be inserted between the anterior or lateral portions of the projection and the anal sphincter Any intussusception which has advanced to the anus will usually be accompanied by considerable distension and symptoms of intestinal obstruction

Obstruction and peritonitis

The late stages of an intussusception of which the apex has not advanced as far as the rectum and which is accompanied by advanced symptoms of intestinal obstruction or peritonitis (i e distension frequent vomiting toxæmia and collapse) can only be diagnosed from the other causes of those symptoms by the history of onset and previous course of the disease

Henoch s purpura

In children who have passed infancy and occasionally in infants intussusception has to be distinguished from *Henoch s purpura* a disease characterized by abdominal pain vomiting the passage of blood per anum and frequently accompanied by arthritis and an eruption of purpuric spots The bleeding from the gut is due to an effusion of blood into the walls of the intestine The youngest child in the series described by Henoch was four years old so the age incidence of the two diseases may be a help in diagnosis In doubtful cases a very thorough search must be made for purpuric spots or for joint affections Very rarely the two conditions have been coexistent Here again a barium enema may clinch the diagnosis

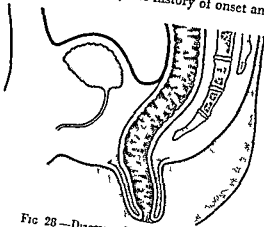


FIG 28 —Diagram of rectal prolapse

In making a rectal examination of a child with an intussusception which has advanced to the descending or sigmoid colon though it may be impossible to feel the swollen advancing apex, yet there may be characteristic œdema of the mucous membrane of the rectum in advance of the apex There may be also a certain amount of ballooning of the rectum

SUBACUTE AND CHRONIC INTUSSUSCEPTION

There are some cases of chronic intussusception which are accom

panied by slight signs of intestinal obstruction, but progress steadily with repeated attacks of pain, sometimes at considerable intervals, until a final serious attack of obstruction occurs In these cases there may be normal or almost normal fæcal motions until the final attack, and the observer is very likely to be misled by the chronicity or intermittence of the symptoms I have known such a case taken for *tuberculous peritonitis and enteritis* There were loose fæcal motions and an epigastric swelling thought to be rolled up omentum but in reality an intussusception In these subacute cases the help afforded by radiography after administration of a bismuth or barium meal is of the utmost value

If after thorough examination there still remains doubt about the diagnosis of an intussusception it should be regarded as less risky to advise exploration of the abdomen than to wait for serious acute obstructive symptoms

INTUSSUSCEPTION OF PELVIC COLON IN OLD PEOPLE

Intussusception is very rare in old people, but when it does occur generally affects the sigmoido rectal region This leads to frequent hypogastric pains and tenesmus, whilst mucus and later blood, are passed through a rather patulous anus Rectal examination easily demonstrates the œdematous apex of the intussusception, which is seldom more than a few inches long A malignant growth may some times form the apex

X

ACUTE OBSTRUCTION OF THE LARGE INTESTINE

CANCER OF THE COLON, VOLVULUS

IF STRANGULATED hernia be excluded, cancer of the large bowel is the commonest cause of intestinal obstruction in persons over middle age The symptoms are often insidious and though in most cases an acute attack of obstruction may be the direct cause for the calling in of the surgeon yet there are many earlier warning signs and symptoms which should put the observer on guard and cause a thorough examination to be made

Early diagnosis of cancer of the colon will lead to the prevention of obstruction by earlier treatment For that purpose we consider it useful to include here a brief summary of the early symptoms

The cancer may be either a quickly growing adeno carcinoma or more commonly a scirrhus which contracts as it grows until a small tight stricture round the bowel is formed (Fig 29) Glands are usually involved rather late so that early diagnosis is desirable both to prevent obstruction and to permit a favourable attempt at cure

SYMPTOMS OF CANCER OF THE COLON

SYMPTOMS PRIOR TO ACUTE OBSTRUCTION

Bowel ulceration

Diarrhœa and the passage of blood and mucus may result from ulceration of the bowel The occurrence of diarrhœa may lead patients to assert that the bowels are regular whereas the looseness is but secondary to the irritation caused by the constipated fæces Owing to the presence of mucus the condition may wrongly be diagnosed mucous colitis

Tumour

The presence of a tumour which in the early stages may be freely mobile is uncommon since the majority of the cases are of the contracting scirrhoid type with no palpable tumour

Extension to other viscera

The growth may adhere to the bladder, or pelvis of the kidney, and cause symptoms referable to the urinary organs, or it may cause gastric symptoms owing to adhesion to the stomach

Pericolitis

Pericolitis, or inflammation of the tissues round the colon, may be the first symptom of note A local abscess may form and mask the primary condition Sometimes perforation of the bowel suddenly takes place into the general peritoneal cavity and diffuse and generally fatal peritonitis ensues

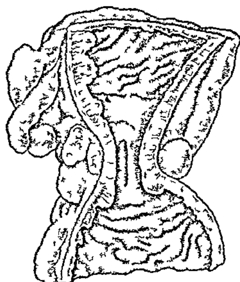


FIG 29 —Drawing of the common ring type of scirrhus cancer of the colon which causes intestinal obstruction (From a specimen in St Mary s Hospital Museum.)

SYMPTOMS OF SUBACUTE OBSTRUCTION

These comprise the same symptoms as those caused by acute obstruction, but they are all of slighter degree *Gradually increasing constipation* is often the first abnormality and if this supervenes in a person over middle age who has previously been perfectly regular as to the bowels suspicion should be aroused and thorough investigation carried out Diarrhœa sometimes alternates with the constipation Occasional attacks of distension and flatulence are common Peristalsis may sometimes be seen through the abdominal wall, and local swelling may subside with a gurgling sound due to passage of flatus through the stricture Pain is cramp like and due to the peristalsis Sometimes the patient will describe the pain as travelling across the abdomen and increasing in intensity up to the site where the gurgling occurs and where the obstruction is situated The pain is often mistaken for indigestion, and the accompanying nausea or sickness attributed to a bilious attack

SYMPTOMS OF ACUTE OBSTRUCTION

Acute obstruction is sometimes though seldom, the first significant



Series of radiographs taken during the administration of a barium enema in a case of intussusception

(a) The opaque barium stopped its advance in the transverse colon at the site of the intussusception

(b) The enema is reducing the intussusception and filling the ascending colon

(c) The intussusception has been forced back to the caecum which is filling with barium

(d) There still remains a small part of the caecum which does not fill with barium Operation showed this was due to the last unreduced part of the intussusception

(*a*)



Duodenal atresia Premature infant at 32 weeks Bile stained vomiting at 12 hours
Radiograph at 16 hour

(*b*)



Small gut volvulus with 270 rotation Full term delivery light vomiting on third day increasing vomiting abdominal distension and visible peristalsis on fourth day

(*c*)



Meconium ileus Full term delivery by 36 hour increasing abdominal distension vomiting and no passage of meconium

symptom which compels attention The acute symptoms are, as a rule precipitated by some hard bolus of food stopping up the lumen which has been gradually narrowing for some long time Plum stones or similar hard objects may suffice to complete the obstruction The contents of the left side of the colon are more firm and the obstruction is more common in that part

Since the contents of the cæcum and the right half of the colon are more fluid, it is not so common for acute symptoms of obstruction to supervene from a growth in this part If however, the ascending colon does get obstructed by a scirrhoid growth the final onset of acute obstruction may lead to a sudden distension of the cæcum which, so long as the ileo cæcal valve remains intact will form a painful rounded, resonant and probably tender swelling in the right iliac fossa and the hypogastrium

When the obstruction is in the left side of the colon and the ileo cæcal valve functions well it will be possible to locate the obstruction by noting where the distension suddenly ceases This can be more clearly shown by a plain radiograph

When however, as often happens, *the ileo-cæcal valve loses its efficiency*, then the lower ileum soon becomes distended and it may be very difficult to determine the exact point of obstruction for the symptoms of small gut obstruction are added to those of obstruction of the large bowel Severe pain frequent vomiting and increasing distension present great difficulties and even an X ray may not unravel the problem.

Distension vomiting pain and constipation occurring in an elderly person without any evidence of peritonitis are generally due to cancer of the large bowel, volvulus diverticulitis or rarely to intussusception or uræmia Inasmuch as cancer of the rectum may finally lead to complete and acute obstruction, it is always necessary to make a careful rectal examination The urine must be examined to exclude renal disease

Diverticulitis when it causes obstruction produces symptoms indistinguishable from those of cancer of the bowel

VOLVULUS

Volvulus of the large intestine occurs usually in one of two places —the sigmoid and the cæcal regions The sigmoid is by far the most common situation owing to the fact that the sigmoid mesocolon is long and the base of attachment narrow so that twisting of the loop more readily occurs Ileo cæcal volvulus is more rare

VOLVULUS OF SIGMOID COLON

Sigmoid volvulus causes symptoms of acute or subacute intestinal obstruction of large bowel type There is usually a preliminary period during which attacks of abdominal pain and constipation may occur

The *acute attack* is signalized by absolute constipation (very quickly demonstrated by administering a turpentine enema), acute abdominal pain, and *rapid distension of the abdomen* According to Barnard the early appearance of tenderness due to onset of peritonitis is a distinguishing feature, but this would *only follow quickly* where there was an absolute strangulation of the coil, which is by no means constant If the vessels of the loop are completely occluded gangrene of the loop quickly occurs, and peritonitis ensues rapidly The great abdominal distension may seriously impede respiration

Subacute sigmoid volvulus

This is distinguished by abdominal pain (chiefly referred to the umbilical and hypogastric zones), constipation, and gradually increasing distension The distended sigmoid coil may stand out sometimes in the lower abdomen like the segment of a large pneumatic tyre, but later the whole abdomen will become generally distended

Though the diagnosis of volvulus is not always made before operation the condition should be suspected when early and great distension supervenes in a case of acute obstruction Localization of the distension to the hypogastrium at the outset, or the standing out of one large coil, may point clearly to a sigmoid volvulus Though the pain of sigmoid volvulus is usually hypogastric and not severe, I have known a twisted sigmoid in a young woman cause such severe pain in the lower lumbar region posteriorly that it was thought the pain might be due to acute dysmenorrhœa Considerable help can be gained from examination of a plain X ray of the abdomen when the one distended coil may be plainly visible (See Plate 6c)

ILEO CÆCAL VOLVULUS

This gives rise to symptoms similar to but more acute than those described under obstruction of the lower end of the small gut, but in addition there will be a localized distension due to the dilated cæcum observable either in the epigastrium or the right side of the abdomen Pain is very severe and vomiting is a prominent symptom Later the general distension would mask the local cæcal dilatation Donhauser and Atwell state that volvulus of the cæcum presents no characteristic group of signs or symptoms but they add that the abdomen becomes silent early in the course of the disease

VOLVULUS OF THE TRANSVERSE COLON

This is seldom seen except after major abdominal operations in which the intestines have had to be displaced and the colon may have been twisted in replacement I have known it to occur after abdomino perineal excision of the rectum and after hysterectomy Some days after the operation the abdomen becomes greatly distended the bowels are not opened yet there is no sign of peritonitis nor of paralysis of the intestines Reopening of the abdomen is necessary to correct the volvulus

DIFFERENTIAL DIAGNOSIS OF OBSTRUCTION OF THE LARGE GUT

In every case it is necessary first to examine all the hernial apertures There are four conditions which may deceive the observer and cause him erroneously to believe that he is dealing with a case of primary obstruction of the large bowel They are

1 Colitis with distension 2 Uræmia
3 Peritonitis 4 Reflex paralysis of colon

COLITIS WITH ATONIC DISTENSION OF THE INFLAMED BOWEL

There are cases of severe ulcerative colitis in which either as a direct result of the ulceration or as a consequence of the toxæmia the large bowel becomes enormously distended and atonic so that organic obstruction is diagnosed If seen at a late stage for the first time it may be impossible to distinguish between the two conditions but the long history of symptoms pointing to ulceration of the colon (diarrhœa with passage of blood and mucus) in the one case and the usual history of subacute obstruction in the other may help in determining In ulcerative colitis the obstruction is never complete and an enema will bring away flatus whilst the toxic symptoms will be greater If seen at an earlier stage a radiograph taken after a bismuth or barium meal might demonstrate any obstruction in the colon but the patients are often too ill to have this done

URÆMIA

Abdominal distension and vomiting are sometimes seen in uræmia and unless a practice is made of examining the urine for albumin in every case of supposed intestinal obstruction in middle aged or older persons serious mistakes will be made The estimation of the blood pressure and percussion of the cardiac dullness may throw light on

doubtful cases Symptoms indistinguishable from those of intestinal obstruction may occur in acute nephritis, chronic nephriti , and fibro cystic disease of the kidneys

PERITONITIS

There are some forms of peritonitis which are accompanied by very *slight rigidity of the abdominal wall*, and there are some abdominal walls in fat, flabby subjects which are almost incapable of becoming rigid on account of the weak and fat infiltrated muscles In such *patients the distension and vomiting of peritonitis may be mistaken* for mechanical obstruction The late stages of peritonitis are accompanied by a paralytic obstruction of the bowels, and the later stages of *intestinal obstruction are frequently accompanied by peritonitis*, due to organisms escaping through patches of local gangrene or ill nourished areas of the gut

In the early stage of both conditions diagnosis is usually clear on considering the history and symptoms, but in the later stages it may be impossible to differentiate

REFLEX PARALYSIS OF THE COLON

There is a deceptive form of paralytic distension of the colon which on several occasions I have known to simulate obstruction of the large bowel It appears to be a reflex result of an acute inflammation some where in the abdomen and in three cases which I can recall was a secondary effect of acute cholecystitis, and masked the primary con dition The ascending, transverse and descending colon may be dis tended, and it may be difficult to get the bowels to act These symp toms, with the pain and vomiting are sufficient to divert attention from the true cause unless special care be taken

XI

THE EARLY DIAGNOSIS OF STRANGULATED AND OBSTRUCTED HERNIAS

A STRANGULATED hernia is one of the commonest and most dangerous forms of intestinal obstruction The hernial orifices through which the abdominal contents protrude have for the most part hard fibrous edges which quickly cause either local necrosis of the gut at the site of pressure, or interference with the blood supply in the accompanying mesentery with consequent gangrene of the gut It is often very difficult to make certain whether a hernia is merely obstructed or whether it is strangulated, for pain and constipation are usually present in both cases

The symptoms of a strangulated hernia are those of intestinal obstruction with the addition of a painful, tender and often tense swelling in one of the hernial regions In certain cases however, there may be little or no local tenderness to call attention to the hernia The type of obstructive symptoms will naturally vary according to the nature of the parts strangulated in the sac If jejunum be caught in the hernia very acute symptoms ensue if ileum be obstructed less acute manifestations result whil t with large bowel alone in the sac the symptoms are usually subacute but none the less serious When omentum alone is strangulated there will be pain constipation nausea, and sometimes vomiting but the obstruction of the gut is never complete and the bowels may be emptied by enemas

Shock is a variable factor but may be very acute in some strangulations The vomiting gradually becomes fæculent when small intestine is strangled

Since apart from operation it is next to impo sible to make certain that there is no gut in the sac and inasmuch as mechanical obstruction to the bowel is ultimately as dangerous as strangulation it is well to treat all painful ten e hernias as if they were strangulated We consider that save in the case of very easily reducible swellings all painful hernias accompanied by abdominal pain and other symptoms of obstruction, should be treated as strangulated hernias by operation without attempting taxis If an anæsthetic has to be given for reduction it is much better to reduce by open operation Fomentations and icebags should be regarded as causing unwise and dangerous delay and taxis should only be adopted when surgical operative procedures are for good reasons impossible or inadvisable

There are a few practical diagnostic points which may be considered with each of the several varieties of hernia

STRANGULATED INGUINAL HERNIA

It is usually a very easy matter to diagnose a strangulated inguinal hernia The patient has usually been aware of the existence of the hernia for some time, and may have been wearing a truss The sudden coming down of the rupture, accompanied by abdominal pain, vomiting, and tenseness and tenderness in the local swelling, make a clear picture But mistakes are possible in the following conditions

INFLAMED HERNIA —This may cause local symptoms similar to those present in one that is strangulated but shock is absent, intra abdominal pain is absent or slight, and vomiting is quite a minor feature and never becomes fæculent

ACUTE HYDROCELE OF THE CORD —Although rare, this has been known to simulate a strangulated hernia but the painful tense inguinal swelling of an acute hydrocele would not cause so severe vomiting and never fæculent vomiting, nor would there be any evidence of intestinal obstruction Turpentine enemas would always produce a satisfactory result

VOMITING DUE TO SOME OTHER CONDITION —This may in the presence of an unreduced inguinal hernia give rise to a suspicion of strangulation The vomiting of pregnancy or that at the onset of appendicitis may lead to this mistake But in such cases the sac is usually neither tender nor tense and the contents may be easily reducible When a catastrophe, such as the perforation of a peptic ulcer or rupture of the gall bladder happens to occur in a patient who has an unreduced hernia, there will be tenderness over the hernial site, and diagnosis has to be made by considering the history and other abdominal signs and symptoms

INFLAMED INGUINAL OR ILIAC GLANDS —With these the swelling is usually more diffuse and fixed, and there are redness and œdema of the skin and subcutaneous tissues Vomiting and intra abdominal pain will be absent or slight, and fever is sure to be present

TORSION OR INFLAMMATION OF AN INGUINAL *TESTIS* —Occasionally this may closely simulate a strangulated hernia The absence of the testicle from the scrotum on the affected side should make one consider the possibility of the condition In torsion of the testicle the local pain is very severe, and vomiting will begin early in the case but never become fæculent Though constipation may be a symptom, enemas will produce satisfactory results

When a metastasis of mumps occurs in an inguinal testis—a very

rare occurrence—it might lead to a diagnosis of strangulated hernia but there would be no intestinal obstruction

It is to be remembered that a retained testis is often associated with a hernia of the interstitial variety

THROMBOSIS OF VEINS OF THE SPERMATIC CORD —Thrombosis or suppurative phlebitis of the veins of the spermatic cord causes a painful swelling of the cord and its surroundings but with these conditions the testicle is swollen and tender and will give the clue to the condition

SUBPERITONEAL FIBROID —On several occasions I have known a subperitoneal fibroid in pregnant women to cause a swelling in the inguinal region and lead to suspicion of strangulated hernia on account of the coincident vomiting of pregnancy Careful examination enables one to feel the tumour move separately from the abdominal wall and of course the vomiting never becomes fæculent and the tumour is not usually tender

STRANGULATED FEMORAL HERNIA

A strangulated femoral hernia gives rise to more mistakes in diagnosis than a strangulated inguinal hernia The hernia is often very small and may easily escape notice in the thick fat often present in the saphenous region Sometimes only a small knuckle of gut comprising but a small portion of the circumference of the bowel may be caught in the crural canal and scarcely any projection may be felt in the thigh When the hernia is of a large size it consists of a rounded fundus and a narrow neck or stalk which permits free and often *painless* side to side movement of the fundal part This absence of fixity of the sac may lead the observer to think that there is no strangulation

A strangulated femoral hernia might be simulated by

(i) an inflamed inguinal gland
(ii) thrombosis of a saphenous varix
(iii) an inflamed appendix in a femoral hernial sac
(iv) a tense and painful hydrocele of a femoral hernial sac whilst
(v) a strangulated inguinal hernia has often been thought to be present when in fact the trouble was in a femoral sac

INFLAMED INGUINAL GLAND —An inflamed gland is usually more fixed gives rise to more œdema and possibly redness of the parts overlying and usually results from a primary cause which may be detected on the corresponding thigh or ano perineal region Vomiting and intestinal obstruction are of course absent

THROMBOSED SAPHENOUS VARIX —A thrombosed saphenous varix would not ordinarily give rise to vomiting or abdominal pain If the

thrombosis extends up to the iliac vein there will be pain and tenderness in the iliac region

INFLAMED APPENDIX —An inflamed appendix in a femoral hernial sac cannot be distinguished definitely from a strangulated omental femoral hernia before operation, though by the history of previous attacks of appendicitis it might be suspected If fæculent vomiting occur it would, of course, be clear that bowel was strangled in the sac The presence of an inflamed appendix would be suspected if hyperæsthesia were elicited within the iliac triangular area

STRANGULATED INGUINAL HERNIA —This is distinguished from a femoral hernia by noting that the swelling comes out of the abdomen medially to the pubic spine and above Poupart s ligament

In general, any swelling in the region of the femoral canal which suddenly appears or becomes larger and more painful, and is accompanied by *vomiting or nausea,* should be considered as a case of femoral hernia in need of immediate operation A small femoral hernia containing strangulated gut may sometimes give rise to very slight local pain or tenderness In such cases the general abdominal pain and the vomiting may dominate the scene and the small hernia be overlooked

In those rare cases in which a pouch of the cæcum becomes tightly gripped in a femoral hernia there may be no abdominal pain, no vomiting and no intestinal obstruction, even though the herniated portion become gangrenous This fact makes it all the more necessary to explore any doubtful tender lump in the femoral region

OBSTRUCTED AND STRANGULATED UMBILICAL AND VENTRAL HERNIAS

Umbilical hernia

Umbilical or para umbilical hernia is most common in women and chiefly seen in fat persons A very fat woman in a surgical ward is nearly always there on account of gall stones or an umbilical hernia

An umbilical hernia usually contains omentum and frequently large bowel Small intestine is not quite so commonly found in the sac When obstruction or strangulation occurs the symptoms are *therefore* much more likely to be subacute and partake more of the character of large bowel obstruction The two common mistakes made in regard to umbilical hernia are (1) to overlook a small *hernia lying deeply* embedded in fat, and (2) to think that the hernia is not strangulated because the symptoms are not very acute The fact that the mortality for operations on *strangulated umbilical hernia* is three times that for

strangulated inguinal and femoral shows the serious need for more early diagnosis and interference

It is quite common for a patient to have several attacks of obstruction before the more serious strangulation attack occurs The fact that on previous occasions the obstruction has been overcome by aperients may lead to an erroneous opinion that the same will occur again The symptoms of the two conditions are at first similar It is sometimes only by the most serious symptoms of strangulation (gangrene of gut or omentum fæcal abscess even gangrene of the skin overlying the hernia) that the patient and medical attendant realize the extremely serious nature of the case

DIAGNOSIS —The diagnosis of an obstructed umbilical hernia is made on the occurrence of abdominal pain vomiting constipation, and

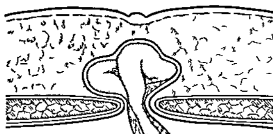


FIG 30 —Drawing to show how an umbilical hernia may be embedded in and hidden by a fat abdominal wall.

local tenderness on pressure over the swelling which can always be felt deep in the fat even if it does not bulge obviously on the surface in the region of the umbilicus The administration of two turpentine enemas with an interval of a few hours will determine whether real obstruction of the large bowel exists, and if that is demonstrated it is unwise to wait for the more serious symptoms of strangulation before advising operation If small gut be obstructed in the sac symptoms will be correspondingly more acute and vomiting will soon become fæculent

It is often difficult to say before opening the sac whether one is dealing with simple obstruction or with strangulation

Ventral hernia

The same general remarks apply here as in the case of umbilical hernia with the exception that small bowel is more commonly found in the sac and consequently acute symptoms are more frequently

observed Abdominal pain vomiting, constipation and local tenderness over the site of a ventral hernia are sufficient to indicate the need for operation

Obturator hernia

This is very rare and should be classed among the internal hernias since there is usually no external swelling though there may be tenderness and a little fullness in the upper adductor region of the corresponding thigh The condition is rarely diagnosed before opening the abdomen, but it is possible that the thigh rotation test might give assistance in diagnosis When the hernia presses upon the obturator nerve, the significant pain felt in the region of distribution of the nerve in the thigh might draw attention to the hernia (Wakeley)

XII

ACUTE ABDOMINAL SYMPTOMS DUE TO VASCULAR LESIONS

THE PAST fifteen years has seen a rapid and notable advance in the surgery of the large blood vessels and many conditions which were formerly quite outside the realm of curative operative surgery have become amenable to such treatment

The main conditions which need to be noticed are

- Mesenteric thrombosis or embolism
- Dissecting aneurysm
- Leakage or rupture of an aneurysm
- Internal hæmorrhage from other causes

MESENTERIC THROMBOSIS OR EMBOLISM

Mesenteric thrombosis most often affects the territory of the superior mesenteric artery It may affect one or more of the branches of the artery or vein but the main trunk of the artery is sometimes affected The symptoms will vary according to the extent of the lesion

The patient may give a history of previous thrombotic lesions not necessarily within the abdomen A history of recent endocarditis might point to a possible arterial embolism while hepatic disease would be a factor pointing to the possibility of venous thrombosis

The pathological changes following a serious thrombotic lesion of the mesenteric vessels are rapid in onset The segment of intestine to or from which the affected vessels run becomes congested and effusion takes place into the wall of the bowel The circulation stagnates and the vitality of the bowel diminishes and often results in gangrene of lesser or greater extent If the main trunk of the superior mesenteric artery is blocked gangrene of the major part of the jejunum and ileum may result It is encouraging to know that resection of such an extensive part of the bowel has been followed by recovery and continued good health of the patient

Symptoms

The symptoms caused by an extensive mesenteric thrombosis are usually very acute The first and most obvious symptom is very severe central abdominal pain which may be difficult to control by morphine The pain becomes constant, and within a few hours there may be a

tender mass felt in the upper or central abdomen The patient is often collapsed As the condition progresses the pulse rate increases, the blood pressure falls, and there may be fever and a leucocytosis Distension gradually ensues From the infarcted vessels some blood escapes into the lumen of the bowel and blood may even be passed per anum, if not passed spontaneously, it may be demonstrated by the administration of an enema (Cokkinis)

The next stage of the condition is that of obstruction of the bowel vomiting and abdominal distension develop and, if nothing be done, peritonitis may end the scene

Diagnosis

Diagnosis has to be made from perforated peptic ulcer, hæmorrhagic pancreatitis dissecting aneurysm, and in the later stages from other forms of intestinal obstruction and peritonitis A help in diagnosis may be provided by abdominal paracentesis (Mersheimer *et al* 1953) The obtaining of sero sanguineous fluid would indicate that the lesion was likely to be either mesenteric thrombosis, strangulation of a coil of intestine, or possibly hæmorrhagic pancreatitis This would call for immediate exploration

DISSECTING ANEURYSM

The term dissecting aneurysm is applied to that condition in which there is an erosion of the inner lining of an artery through which the blood escapes into the substance of the wall of the artery, and courses along within its substance parallel to the main stream splitting the arterial wall in its middle muscular coat The initial lesion is commonly in the upper thoracic aorta The aorta may be split along the whole of the thoracic trunk, and sometimes also along almost the whole of the abdominal aorta Sometimes the blood may force its way back into the main stream and there have been a few instances in which this has resulted in a stoppage of the tearing process Commonly, however, the process may extend to the common iliac, and lead to a partial or complete occlusion of this vessel

Though this pathological condition was known many years ago, it did not become a recognizable pathological process and had exceedingly seldom been diagnosed during life until the publication of Shennan's classical monograph in 1933 Since that date the condition has more often been correctly diagnosed for in a considerable number of instances, the symptoms are sufficient for a fairly confident recognition

Symptoms

The main symptom of dissecting aneurysm is an unbearable pain

starting in the thorax, sometimes radiating at first up to the neck or through to the back, but gradually extending down to the abdomen and sometimes even to the hip or thigh A recent writer (Dean Warren) gives this warning 'In any patient with pain in the chest or back of such severity that narcotics fail to relieve it, the diagnosis of a dissecting aneurysm should be considered' When the lesion reaches the abdominal aorta there will be general abdominal pain, and the abdominal wall may become rigid so that a perforated peptic ulcer may well be suspected or even hæmorrhagic pancreatitis or me enteric thrombosis

Diagnosis

Diagnosis will be helped by consideration of the following points The pulses should be felt in all four limbs and so far as is possible, the blood pressure should be measured in each limb With a dissecting aneurysm there will almost certainly be serious differences between one upper and one lower limb pulse according to the position of the lesion There may be an aortic diastolic murmur (This will only be of value if the patient were known not to have such a murmur prior to the illness) If the renal artery be involved there may be some hæma turia and perhaps a rise in the blood urea The limitation of blood supply to parts supplied by affected arteries may lead to numbness paræsthesia or even hemiplegia or paraplegia if the arteries supplying the spinal cord be affected The chief distinguishing features are however the change of position of the pain from the thorax to the abdomen the inequalities of the pulses and sometimes cessation of the pulse in one femoral artery

Very recently it has been shown that operative relief may some times be given these patients if they can be conveyed to a centre where surgeons experienced in this type of work are available

LEAKING OR RUPTURE OF AN ABDOMINAL ANEURYSM

Large abdominal aneurysms are usually easily diagnosable both clinically and radiologically when they rupture, death is usually almost immediate When of moderate or small size, diagnosis may be difficult without the aid of aortography or arteriography When the small aneurysm affects one of the branches of the aorta, diagnosis may elude all available resources and the source of the pain to which it may give rise may remain undiagnosed until some further complica tion or catastrophe gives the necessary clue This clue is frequently leakage or rupture into the peritoneal cavity or more rarely into a viscus

In a patient who has no indication of neurosis the complaint of a

constant abdominal pain of definite position or radiation must always be regarded seriously, and the possibility of aneurysm must be borne in mind I well remember the difficulty of diagnosis in a man over sixty years of age who complained of constant pain which was felt on both sides of the abdomen just above Poupart s ligament No other symptoms were complained of and no physical sign was detectable or at least detected by the combined efforts of a general physician a general surgeon, a neurologist an orthopædic surgeon and a radiologist (This was before the days of aortography) The patient went to another part of the country, where a similar diagnostic blank was drawn by another diagnostic team Suddenly the patient collapsed and died, and the autopsy showed that the cause of the pain had been a small aneurysm which was eroding the vertebral column, death had resulted from a rupture of the aneurysm into the duodenum

There are special features relating to aneurysms of the splenic, cœliac axis, and renal arteries

The early history of an *aneurysm of the splenic artery* may closely simulate a gastric or duodenal ulcer and by pressure on or erosion of the stomach it may cause hæmatemesis and melæna The pain is felt in the left hypochondrium Leakage or rupture of an aneurysm of the splenic artery may take place into the lesser sac or into the general peritoneal cavity

Parsons has pointed out that when the aneurysm ruptures into the lesser peritoneal sac, the symptoms may be very acute and closely simulate the perforation of a peptic ulcer or acute pancreatitis, even acute intestinal obstruction may be suspected The diagnosis is likely to be made only after exploration of the abdomen

When the aneurysmal sac ruptures into the general peritoneal cavity, the symptoms will be those of internal hæmorrhage of which the exact source is unlikely to be diagnosable before exploration A small aneurysm of the cœliac axis may cause equivocal symptoms its rupture may cause collapse, the cause of which may be difficult to determine before exploration I once explored the abdomen of a male patient who gave a history suggestive of a duodenal ulcer and came under my observation on account of abdominal pain and collapse The peritoneal cavity was found full of blood The source of the bleeding was not obvious, but there were some superficial lacerations of the spleen and that organ was removed A blood transfusion was given and the abdomen sewn up For two days the patient improved but then occurred a further collapse and death At the autopsy the cause of the bleeding was found to be a small aneurysm of the cœliac axis

The diagnosis of aneurysms of the aorta and its branches would

until recently have been of mere academic interest, but during the last five years many successful resections of such aneurysms have been recorded

Rupture of aneurysm of the renal artery

These aneurysms usually rupture into the retro peritoneal space, causing the sudden appearance of a tender swelling in the right or left iliac and lumbar regions There will be some fever, and on the right side the condition may closely simulate an appendix abscess The suddenness of the appearance of the swelling should put one on guard

SUDDEN INTRA PERITONEAL HÆMORRHAGE

Apart from injury and aneurysm it is very rare for hæmorrhage into the peritoneal cavity to occur in the male Spontaneous rupture of a malarial and occasionally of an apparently normal spleen may take place and there have been a few instances of profuse bleeding into the peritoneal cavity from a ruptured gangrenous gall bladder In the female ectopic gestation is the commonest cause (see Chapter XIV) Severe intra peritoneal bleeding may result from the rupture of a small Graafian cyst of the ovary this must be suspected when collapse and signs of intra peritoneal bleeding occur in a young female adolescent in whose case an ectopic gestation can be excluded

XIII

ACUTE ABDOMINAL SYMPTOMS IN PREGNANCY AND THE PUERPERIUM

ACUTE ABDOMINAL pain in a pregnant woman is always a source of special anxiety, both from the maternal and the fœtal point of view Exploratory operations are not lightly to be advised on account of the risk of abortion, and one therefore needs to be very sure of the indications of the various acute diseases needing intervention before advising the abdomen to be opened

ACUTE CONDITIONS MET WITH DURING PREGNANCY AND THE PUERPERIUM

The following conditions giving rise to acute abdominal symptoms may be met with during pregnancy or the puerperium

1 Persistent vomiting
2 Ectopic pregnancy
3 Retroverted gravid uterus
4 Threatened abortion
5 Sepsis following attempts at abortion
6 Pyelitis
7 Degeneration in a fibroid
8 Spontaneous rupture of the uterus
9 Appendicitis
10 Perforated gastric ulcer
11 Torsion of the pedicle of an ovarian cyst or pedunculated fibroid or torsion of a normal ovary
12 Pelvic peritonitis or cellulitis

Persistent vomiting

The morning vomiting of pregnancy usually begins in the second and continues through the third month As a rule it does not cause any anxiety, but when accompanied by any abnormality in the abdomen it may give rise to doubt On several occasions I have known serious doubt occur in pregnant women who were vomiting and also had a slightly painful swelling in the right inguinal region It was thought that a strangulated inguinal hernia might be causing the symptoms but examination showed in each case a uterine fibroid which had risen out of the pelvis with the enlarging uterus and had

simulated a hernia by bulging out the inguinal canal The vomiting in such cases takes place without the occurrence of any pain in the swelling and, on deep respiration it is possible to feel any intra abdominal swelling move independently of the abdominal wall

I have also known the vomiting of early pregnancy, when accom panied by slight pelvic pain due to congestion or constipation to be mi taken for appendicitis, but careful pelvic and abdominal examina tion, and a close attention to the symptom sequence, should exclude this condition

The excessive vomiting due to the toxæmia of pregnancy does not concern us here but it is necessary to make sure that there is not any serious intra abdominal lesion before diagnosing hyperemesis gravi darum

Ectopic pregnancy

This is so important and common that the next chapter is devoted to that subject alone

Retroverted gravid uterus

This condition, well termed by Matthews Duncan ' the disease of the third and fourth months of pregnancy" may give rise to acute abdominal pain felt chiefly in the hypogastrium where the distended bladder is ituated The fact of pregnancy considered along with the presence of a hypogastric swelling (larger than the uterus should be for that time of gestation) *the occurrence of pain, nausea, and reten* tion of urine (or maybe dribbling incontinence), would cause one to suspect the condition which would be easily diagnosed after the urine had been drawn off by a catheter

Threatened abortion

Threatened abortion should cause no difficulty in diagnosis when pregnancy is known to exist, since the uterine bleeding with the lumbar backache and hypogastric pain and the absence of evidence of any other local abnormality, should sufficiently determine the condition

Sepsis following attempt to produce abortion

It is unfortunately not unknown for women to try either to produce abortion on themselves or to persuade some lay person to attempt a similar disservice for them Sepsis may follow these attempts and when the doctor is called in it may be difficult to obtain any history of interference The sepsis may take the form of a peritonitis a septi cæmia or both There is generally bleeding from the uterus In any

case, therefore, of bleeding from the uterus in a woman who has had a period of amenorrhœa and in whom abdominal pain, vomiting and fever suddenly present themselves, one must bear in mind the possibility of uterine sepsis Septicæmia and peritonitis in such cases are usually rapid and virulent The onset is unlike that of any other abdominal condition, and the pain may be felt not only in the hypogastrium but may be referred to the back or down the legs Careful bimanual examination will determine an enlarged softened uterus and may exclude any other pelvic condition In any such case it is wise to have a consultation with a fellow practitioner before deciding on any course of action

Pyelitis

Pyelitis is not an uncommon complication of pregnancy It occurs usually about the fourth month of gestation and its onset may have some relationship to the pressure of the growing uterus upon the ureters, especially the right ureter, for the condition is more common on the right side

The symptoms commonly start with a rigor or feeling of chilliness, and the temperature quickly rises to 103° F or thereabouts At the same time pain is felt in one or other loin (generally the right) under the costal margin Pressure at the erector costal angle produces pain There may be some frequency of and pain on micturition but this is not constant There is as a rule no rigidity of abdominal muscles In some cases the patient does not feel ill whilst at other times there may be severe malaise Examination of the urine shows turbidity, albuminuria, and the presence of pus in small quantity Bacteria, usually *Bact coli* (*Escherichia coli*), will be detected on microscopical examination The albumin may not be more than is to be expected to correspond with the pus

When on the right side differential diagnosis must be made from appendicitis This is usually easy, for appendicitis seldom starts with a rigor, infrequently causes such high fever as 103° F or 104° F and is often accompanied by local rigidity and not so frequently by any urinary trouble Examination of the urine should settle the diagnosis

Appendicitis and perforated gastric ulcer

These are misfortunes that may overtake the pregnant as any other woman, and they should be diagnosable readily by considering the symptoms carefully Sometimes when they occur in the puerperium they may be mistaken for the results of puerperal sepsis The symptoms however, should be readily interpreted if the possibility of their occurrence be borne in mind

Torsion of an ovarian cyst

In the puerperium also it is not uncommon for a *dermoid* or other *ovarian cyst* to become *inflamed* or undergo *torsion* owing to the contusion and displacement consequent on the labour There will be acute abdominal pain, fever vomiting and a tender hypogastrium, whilst a rounded swelling will be felt near the *uterus* but separate from it A distended bladder should be excluded by catheterization, and a twisted fibroid by noting the relation to the uterus

A slightly enlarged but otherwise normal ovary has been known to undergo torsion in early pregnancy and cause pain and vomiting so that an ectopic gestation was thought a likely diagnosis until the abdomen had been opened (Searle)

Degeneration in a fibroid

Red degeneration or necrobiosis of a uterine fibroid is particularly prone to occur during pregnancy The symptoms are pain felt locally in the fibroid, which can be palpated through the abdominal wall, slight fever, and nausea or vomiting In any patient who is known to have a fibroid and to be pregnant such symptoms would point to red degeneration and in such cases it is sometimes possible for the fibroid to be enucleated without disturbing the pregnancy

Rupture of the uterus

Spontaneous rupture of the pregnant uterus is a very rare condition leading to severe shock and signs of internal hæmorrhage For details one must consult an obstetrical textbook

Pelvic peritonitis

Pelvic peritonitis may ensue after childbirth Sometimes this may be septic in nature but in some cases it may be of gonorrhœal origin Any vaginal discharge in the patient or the presence of infection of the baby s conjunctival sacs might give the clue Hypogastric pain and tenderness vomiting or nausea and bilateral tenderness in the uterine fornices will be demonstrable

ACUTE ABDOMINAL DISEASE PECULIAR TO WOMEN APART FROM PREGNANCY

Acute salpingitis

Acute salpingitis is most commonly due to infection with the gonococcus Another frequent cause is infection with the staphylococcus or streptococcus It can also be caused by the *Bact coli* (*Escherichia coli*) or the pneumococcus

SYMPTOMS AND SIGNS—The picture is that of an attack of pelvic peritonitis—hypogastric pain, nausea or vomiting, and fever which may reach as high as 103° F Examination shows tenderness on pressure in both iliac fossæ and in the suprapubic region In some cases the lower abdominal wall is rigid and moves badly on respiration, and there may be considerable distension Vulval examination may show traces of a gonococcal infection, or a purulent vaginal discharge may be present Palpation in the lateral fornices may cause pain

DIAGNOSIS—The common and chief difficulty is to distinguish appendicitis from salpingitis (see Chapter VI, p 73)

The symptom sequence is usually more characteristic in appendicitis, and the pain often more strictly limited to the right side In salpingitis it is common *for the pain to be worse on the left side than* on the right—an occurrence rarely seen in the *early* stages of appendicitis

A vaginal discharge in which gonococci are detected would be significant

It is frequently very difficult and almost impossible to make quite certain whether the appendix or salpinx is primarily at fault

When pelvic peritonitis follows childbirth it may not show itself for a week or more after the birth

Pyosalpinx

Many cases of salpingitis quieten down and form a local collection of pus within the Fallopian tube—pyosalpinx The condition is usually bilateral For a time symptoms may abate and be almost negligible but sooner or later the infection spreads and an extension of inflammation occurs There will be the symptoms of pelvic peritonitis as in the case of salpingitis, but in addition there will be felt a bilateral tender swelling in the pouch of Douglas The symptoms in a ruptured pyosalpinx are often the more serious since there is *frequently* secondary infection of the pus sac by organisms other than the gonococcus

Ovarian cyst

An ovarian cyst with twisted pedicle gives rise to acute symptoms Hypogastric pain, vomiting, and the presence of a tender swelling in the lower abdomen are the principal features

The vomiting comes on almost as soon as the pain, so that there is less likely to be an interval between the initial pain and the vomiting as is usual in appendicitis With an ovarian cyst there will be a definite, rounded tender swelling to be felt either by palpating the hypogastrium or by pelvic examination If the case be not seen early, peritonitis with accompanying rigidity may prevent the *full outline*

of the tumour being felt, and it may be difficult to distinguish from other causes of pelvic peritonitis e g acute salpingitis with serous effusion but the symptoms of a twisted ovarian cyst are usually the more acute

Torsion of pedicle of hydrosalpinx

With this the symptoms are similar to those of an ovarian cyst with twisted pedicle, though usually slighter in degree—pain, nausea or vomiting and a tender movable swelling in one or other vaginal fornix In the presence of even the slightest menstrual irregularity it would be impossible certainly to exclude an unruptured ectopic gestation

Endometrioma

Rupture of an ovarian endometrioma may cause hypogastric pain vomiting and fever bimanual examination will reveal a swelling on one or both sides of the pouch of Douglas This clinical picture might easily be mistaken for tubo-ovarian inflammation or even for pelvic appendicitis and it would as a rule be difficult to make certain before exploration

In every doubtful case of acute abdominal disease in women it is necessary to pass a catheter to make sure that the bladder is empty before making a final decision

XIV

ECTOPIC GESTATION

BY ECTOPIC gestation is meant the development of a fertilized ovum in any place other than the uterine cavity The rupture of such a gestation sac is a comparatively common occurrence with fairly characteristic symptoms yet it is often misdiagnosed

Fertilization of the ovum probably normally takes place in the Fallopian tube, and any slight cause may detain the developing ovum, prevent its further progress, and lead to an ectopic gestation A fertilized ovum has been known very rarely to develop in the substance of the ovary, but this condition is of little practical importance since one cannot clinically distinguish it. The commonest place for ectopic development of the ovum is in the ampullary part of the Fallopian tube More rarely it is found in the isthmial part of the tube, and more rarely still it may develop in the tubo-uterine section of the tube or in a rudimentary cornu which for clinical purposes must be included in the same group (Fig 31)

In a tubal gestation, growth of the ovum leads to distension of the tube, whilst the eroding action of the villi leads to a thinning of the wall Gradual oozing of blood may take place into the peritoneal cavity from the eroded area, or any sudden strain may lead to rupture of the tube Sometimes the ovum is extruded through the end of the tube into the peritoneal cavity by a process well termed 'tubal abortion,' or the embryo may die in consequence of hæmorrhage into the sac or rupture of the sac into the lumen of the tube, and thus may be formed a tubal mole

If the embryo lives primary rupture of the sac occurs usually within the first eight weeks of pregnancy, though, in the case of a tubo-uterine or interstitial gestation sac, rupture need not occur till pregnancy has advanced to the third or fourth month

Rupture of the sac causes acute abdominal symptoms which usually subside with the formation of a mass of blood clot in the pouch of Douglas (pelvic hæmatocele), but in some cases death may rapidly occur from the great internal hæmorrhage. It is exceptional for the sac to rupture into the broad ligament [illegible] rupture of [illegible]

If the fœtus continues to develop a[illegible] severe symptoms may be caused at a[illegible] of a [illegible] into the general peritoneal cavity [illegible]

Ectopi[illegible]

who has been married some years or in a parous woman who has not been pregnant for several years

SYMPTOMS AND DIAGNOSIS

A patient with an ectopic gestation may seek advice for abdominal pain

1 Before the sac has ruptured
2 At the time of primary rupture of the sac
3 Some days or even weeks after the rupture

BEFORE RUPTURE OF THE SAC

If the serious complications ensuing on the rupture of a gestation

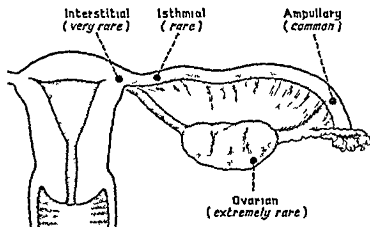


FIG 31.—Diagram to show the possible positions of an ectopic pregnancy

sac are to be avoided it is essential that the condition should if possible be diagnosed before the tube has given way Sometimes there are few if any symptoms premonitory of rupture but frequently there are indications of value which enable one to make a diagnosis with sufficient probability There was a time when it was a rarity to diagnose and remove an inflamed appendix before it ruptured now it is considered something of a reproach to allow an appendix to perforate before surgical advice is obtained In like manner though not to the same degree it is likely that in the future greater attention will be paid to the correct diagnosis and operative treatment of a tubal pregnancy before primary rupture has occurred

In a typical case (such as is seldom seen) the symptoms and signs would be

Amenorrhœa (for one or two months)
Hypogastric pain
Uterine bleeding
Local hypogastric tenderness on pressing into pelvis towards one side
Small tender swelling in the lateral fornix
The passage of a membrane per vaginam

Amenorrhœa

Though in type cases one or two periods may have been missed the breasts may be slightly enlarged and full and even sickness in the morning noted, yet such definite symptoms are rather exceptional

There is, however, nearly always some slight irregularity of menstruation, and care must be taken to ascertain exact particulars as to that event The patient must be asked (1) when was the last period, (2) if that period was before or after the normal time, noting a delay or advancement of as short a period as a day in women who are usually regular to the day, (3) whether the loss at the last period was less or more than usual, (4) whether any slight loss has occurred since the last regular period

Since the gestation sac of an embryo under a month old may rupture or abort through the end of the tube it is not absolutely necessary for there to be any irregularity of menstruation Not uncommonly the bleeding from the vagina which accompanies tubal abortion is mistaken by the patient for the normal menstrual period for it may coincide exactly with the expected menstruation Usually the loss is less or greater than normal, and is antedated or postdated to the regular period by a day or several days Sometimes what was apparently a normal period ceases for a few days, and then bleeding recommences All these slight irregularities need to be noted

Abdominal pain

Abdominal pain of colicky type felt chiefly in the hypogastric or iliac regions may be the chief complaint Taken in conjunction with the vaginal bleeding these pains may suggest both to patient and doctor a threatening abortion The pains are probably due to repeated slight intra peritoneal hæmorrhage or to the contractions of the Fallopian tube

Uterine bleeding

This has been referred to above It is not constant The blood as it comes away from the vagina is stated to be darker than the normal menstrual loss but this is not of much value in diagnosis What is of greater importance if it occurs is the passage of a decidual cast of the

interior of the uterus This seldom occurs till the embryo is dead, or aborted into the abdominal cavity, and often occurs after the operation for removal of a ruptured sac has been performed If it occurs at the time of the early griping pains it is of the greatest help in diagnosis The shreds of membrane do not show any chorionic villi and can thus be distinguished from an embryonal uterine sac They should be floated out in water, so that the full size and shape may be ascertained

Hypogastric tenderness

Hypogastric tenderness may be detected on the side of the lesion if the fingers are gently pressed well down behind the pubis The abdominal wall is not rigid

Bimanual examination

Bimanual examination reveals a small rounded tender movable swelling to one side of the uterus in one or other lateral fornix corresponding to the side where the pain and tenderness are elicited The uterus will also be felt slightly enlarged

To sum up if the patient and the doctor think that pregnancy has begun, if there be irregular hypogastric pain more on one side than the other, and if with slight uterine bleeding a tender rounded movable lump be felt to one side of a slightly enlarged uterus ectopic pregnancy should be diagnosed and operation strongly advised On one occasion when on such grounds I had diagnosed extra uterine pregnancy and advised operation the patient went for confirmation of the diagnosis to a hospital Whilst waiting in the out patient department of the hospital she collapsed from internal bleeding and had to be operated on promptly It is possible, and should be a more frequent occurrence, to diagnose the condition before great internal hæmorrhage occurs

Differential diagnosis

Grandin in reference to tubal gestation observes 'The man who suspects every woman of having the condition is the man who is least liable to err in diagnosis It is frequently misdiagnosed because infrequently considered An early unruptured tubal pregnancy needs to be distinguished from

Gastritis Appendicitis Threatened uterine abortion
Pyosalpinx or hydrosalpinx
Small ovarian or broad ligament cysts

It is only by the casual observer who has not examined the patient that the colicky pain of an ectopic pregnancy threatening to rupture

can be mistaken for gastritis The position and nature of the pain should direct attention to the pelvis, where examination will soon provide facts for correct diagnosis

If the gestation be in the right tube it is easily mistaken for *appendicitis* Some of the *main points in diagnosis may be tabulated*

Symptoms or signs	*Unruptured inflamed pelvic appendix*	*Unruptured (but possibly leaking) tubal gestation*
MENSTRUATION	Usually regular	Usually some irregularity
UTERINE BLEEDING	Usually none	Usually present
INITIAL PAIN	Epigastric	Hypogastric.
FEVER	Slight fever	Usually no fever
VOMITING OR NAUSEA	Present	Unusual
BIMANUAL EXAMINATION	Tenderness but no movable lump	A tender rounded movable swelling to one side of the uterus

If the appendix is not situated in the pelvis there can be little likelihood of mistake Neither with a pelvic appendicitis nor with a tubal gestation is there, as a rule any rigidity of the abdominal wall

A threatened uterine abortion is often difficult to distinguish and on several occasions I have known uterine curettage performed for what was thought to be an incomplete abortion but was in reality a tubal gestation Bimanual examination ought to distinguish for if it be definitely decided that pregnancy has begun, and there be uterine bleeding, pelvic examination will show in the one case a slightly enlarged uterus with a small swelling to one side, and in the other case a larger uterus with no swelling in the lateral fornix

The greatest difficulty in diagnosis would be in the case of an intrauterine pregnancy complicated by a pyosalpinx, hydrosalpinx or small ovarian cyst If severe abdominal pain occurred with any of these it might be impossible to diagnose with certainty, but abdominal section would probably be indicated in any case

RUPTURE OF A TUBAL GESTATION

Rupture of a tubal gestation is probably the commonest cause of sudden death in young women who have previously been in perfect health It brings many more to the gates of death

The symptoms are usually clear

Sudden abdominal pain
Vomiting

Faintness or actual fainting
Sudden anæmia and collapse with small rapid pulse and subnormal temperature
A tender tumid abdomen
Free fluid in abdominal cavity
Tenderness on pressing finger against Douglas pouch

The pain is sometimes hypogastric, sometimes more general or even epigastric, occasionally pain is felt over the clavicles or even in the supraspinous fossa. The anæmia should be looked for especially in the lips tongue, and under the finger nails The sclerotics also have a particularly white appearance, and there is sometimes a dark ring round the eyes Restlessness and occasional deep sighing respirations may indicate the severe internal hæmorrhage

The pulse rate is by no means always a good guide as to the bleed ing for in some people it takes a very large hæmorrhage to cause much increase in rapidity and in others rapid compensation and restoration of the circulation occur Nevertheless the pulse is usually rapid and very feeble and the blood pressure is often considerably lowered

Examination of the abdomen will show a flaccid but tender abdo men with some fullness and (exceptionally) slight resistance to pal pation in the hypogastrium Free fluid may be demonstrated but it is unnecessary and unwise to do so The pelvic peritoneum will be tender and a swelling may possibly be detectable in one lateral fornix The important points to pay attention to are the sudden onset the fainting attack, the grave anæmia feeble pulse and subnormal temperature

Differential diagnosis

Differential diagnosis must be made from several of the very acute abdominal catastrophes such as perforation of the stomach duode num, or gall bladder, acute intestinal obstruction acute pancreatitis acute perforative appendicitis or torsion of the pedicle of an ovarian cyst The history of the case, the sudden onset and the persistence of the extreme pallor and subnormal temperature without rigidity of the abdominal wall in a patient previously well except for some slight irregularity of menstruation seldom or never leave room for doubt

It may be impossible clinically to distinguish rupture of an ectopic pregnancy from *severe hæmorrhage from a Graafian follicle* The latter is a very rare occurrence and usually unaccompanied by any of the signs of pregnancy

CASES WITH SUBACUTE HÆMORRHAGE

We mu t now consider diagnosis after repeated bleedings have caused a hæmatocele to form

Many cases come for diagnosis a short while after an acute rupture of the sac, *or after repeated slight hæmorrhages have led to the formation of a hæmatocele* At the time of observation the bleeding may have stopped and the patient may have recovered sufficiently to get about again The previous serious symptoms may have been attributed by the patient to a simple fainting fit, or the doctor may have thought the trouble due to a cardiac attack This mistake could only arise in those patients who have had moderate internal hæmorrhage, for in the extreme degrees the grave nature of the case cannot be missed

After a moderate hæmorrhage the slight collapse is quickly recovered from the pulse may become normal and the temperature from subnormal may become slightly febrile When there have been repeated slight hæmorrhages there may be no history of acute collapse but usually with repeated attacks of pain the patient will have felt faint Such a patient comes for advice either for abdominal pain and weakness or for pain and uterine hæmorrhage Occasionally retention of urine may be the reason for seeking advice

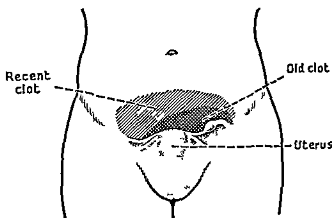


FIG 32 —Diagram of hæmatocele (from the front) (The black area indicates firm and older clot, the dotted portion represents looser and more recent clot)

Diagnosis is made by considering the history of repeated attacks of hypogastric or iliac pain, the irregularity in menstruation and the conditions found on examination which are as follows

1 The patient looks anæmic
2 The temperature is normal or febrile (100° F or 101° F)
3 The pulse is either normal or increased (100 to 120) in frequency

4 There is a fullness of the lower abdomen (due slightly to distension, but chiefly to the blood clot)
5 The lower abdomen is tender on pressure, especially on the side of the tubal gestation
6 Rigidity of the abdominal wall is absent, though the patient may show resentment of any deep pressure by contracting the muscles
7 There is usually some uterine bleeding
8 Pelvic examination reveals a fullness and resistance in one or both lateral fornices Sometimes a definite harder swelling may

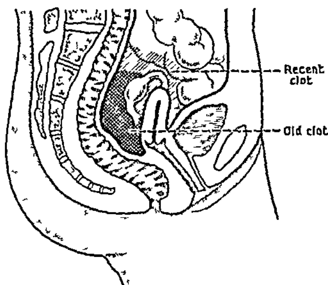


Fig 33.—Diagram of a hæmatocele (lateral view)

be felt If the blood clot is firm bimanual examination reveals a definite tumour filling the pouch of Douglas Pain is always elicited on pressure on the swelling (whether vaginally or per abdomen)
9 There may be retention of urine or frequency of urination
10 On two occasions I have obtained a positive obturator or thigh rotation test (*see Chapter III p 30*)

Additional evidence of internal hæmorrhage may sometimes be obtained in the form of a bluish or purplish discoloration in the region of the navel (Cullen's sign) Such discoloration however, is very inconstant.

Vomiting sometimes occurs with the attacks of abdominal pain, but

is not a constant nor important feature Constipation may be present Diagnosis is usually clear from the above symptoms and signs When the pregnancy has advanced two or three months the softening of the cervix and enlargement of the breasts may help in diagnosis (Fig 33)

Differential diagnosis

Differential diagnosis is sometimes difficult from pelvic appendicitis pyosalpinx, or retroverted gravid uterus

PELVIC APPENDICITIS —This may give rise to nearly all the signs and symptoms of a small pelvic hæmatocele, and the two conditions are frequently confused in diagnosis Hypogastric pain, vomiting, local tenderness, slight fever and tenderness on rectal or vaginal examination are commonly present in both conditions Even the thigh rotation test may be positive in both cases and in neither instance should one expect to find abdominal wall rigidity The main points of distinction are that in an ectopic pregnancy there is nearly always some irregularity of menstruation or even definite amenorrhœa for a month or two usually uterine bleeding, possibly the symptoms of early pregnancy and the appearance of anæmia, and the history of onset is suggestive of internal hæmorrhage and quite different from the usual onset of appendicitis in which the symptom sequence may be definitely helpful in diagnosis

PYOSALPINX —With a pyosalpinx there should not be menstrual irregularity, though menorrhagia is not infrequent and there should be a history of previous pelvic inflammation or of leucorrhœa endometritis or definite gonococcal infection The uterine cervix will not be softened in pyosalpinx, and pain on micturition and retention of urine are less likely to occur

RETROVERTED GRAVID UTERUS —This might be confused with an ectopic pregnancy which had gone on to the third or fourth month of gestation Both may cause retention of urine But if the bladder be emptied by catheter it should be possible to make out the determining factor in diagnosis, i e the absence or presence of the uterine fundus from the normal position The bleeding from a retroverted gravid uterus would be that of fresh blood indicating threatening abortion the blood lost in an ectopic gestation would usually be darker Anæmia would only be observed in the ectopic pregnancy

If the fœtus of an ectopic pregnancy survive the rupture until the later months of gestation, the condition will cause the formation of an abdominal tumour in which the fœtal parts may be felt easily under

XV

CHOLECYSTITIS AND OTHER CAUSES OF ACUTE PAIN IN THE RIGHT UPPER QUADRANT OF THE ABDOMEN

SEVERE PAIN arising in or chiefly localized to the right hypochondriac region is usually due to one of the following conditions

Cholecystitis *Biliary colic*
Inflamed or leaking duodenal ulcer
Rupture of gall bladder or a biliary duct
Hepatitis *Torsion of the gall bladder*

But one always needs carefully to exclude

Appendicitis *Renal pain or colic*
Pleurisy or pleuro pneumonia

The gall bladder and cystic duct may be regarded as a vermiform muscular tube which has a dilated extremity and opens through the common bile duct into the duodenum In certain respects therefore it is analogous to the cæcal appendix Further, it is common for a stone to stop up the cystic duct just as a concretion may occlude the lumen of the appendix The chief difference between the two structures lies in the fact that fæcal material is common in the cæcal appendix but never seen in the gall bladder, though *Bact coli* (*Escherichia coli*) is frequently found in the latter

CHOLECYSTITIS

Cholecystitis or inflammation of the gall bladder, may occur with or without the presence of gall-stones Infection may gain access either from the blood stream (more commonly) or from the intestine via the biliary ducts The intensity of the inflammation varies greatly Sometimes there is a mere catarrh of the mucous membrane lining the gall bladder, which may be full of clear or bile stained mucus while frequently the inflammation involves the whole thickness of the bladder wall which becomes œdematous and friable In extreme cases gangrene of part or the whole of the gall bladder may occur The inflamed viscus may have omentum adherent to it but this does not occur quite so frequently as with an inflamed appendix Rarely both gall bladder and vermiform appendix may be simultaneously inflamed

The contents of an inflamed gall bladder consist either of clear or bile stained mucus, or of mucopurulent bilious material sometimes containing much cholesterin in suspension, or accompanied by gall stones When gall stones are present they may belong to any of the different varieties—the large barrel shaped stone, the multiple small faceted stones, or the innumerable black pigment calculi like small jet beads, which are sometimes embedded in a tar like matrix

When a gall bladder is inflamed the overlying liver substance sometimes enlarges and projects downwards from the liver margin, forming one variety of Riedel's lobe When the gall bladder is only slightly attached to the liver, it may undergo torsion to such an extent that its blood supply may be cut off and gangrene may take place The symptoms would be indistinguishable from those of acute gangrenous cholecystitis

Symptoms

The symptoms of cholecystitis are

Pain Vomiting Fever Constipation
Local tenderness in right hypochondrium
Swelling in region of gall bladder (sometimes)
Rigidity of overlying muscle (sometimes)
Jaundice (rarely)

PAIN —The pain of cholecystitis varies according to whether or not there is a stone attempting to pass along the cystic duct When there is no stone the pain is generally localized to the region of the gall bladder, or if there be contiguous peritonitis (as is not infrequently the case) the pain may be diffused over the right hypochondriac region and even felt occasionally on top of the right shoulder If the liver and gall bladder are much enlarged downwards the pain may extend down almost to the iliac fossa

When there is a stone in the neck of the gall bladder or in the cystic duct the pain radiates also to the area beneath the inferior angle of the right scapula This corresponds to the level of distribution of the eighth dorsal segment from which the gall bladder derives its main nerve supply In uncomplicated cases pain is not felt in the right acromial or clavicular regions

VOMITING —This is also a variable feature It is slight in severity when there are no gall stones and no peritonitis, but when either or both of these are present or when there is a stricture of the cystic duct, there may be constant vomiting or continual retching and bringing up of bilious material

TENDERNESS —Local tenderness over the gall bladder is a constant

feature and frequently when there is no muscular rigidity one can feel the rounded fundus of the viscus projecting below the inferior margin of the liver Usually the swelling is small, but occasionally it may be of considerable size and bulge down well into the right iliac fossa or into the umbilical region

When the inflammation has spread to the parts around the gall bladder there is usually rigidity of the right upper quadrant of the abdominal parietes, which thus protects the inflamed area In some cases of cholecystitis, however, there is no rigidity

FEVER —This is not usually high, but varies from 100° F to 103 F

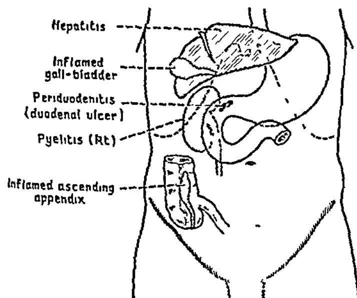


FIG 34.—Diagram to illustrate the differential diagnosis of cholecystitis

according to the extent of the inflammatory process and the virulence of the infection If the bile ducts are simultaneously infected it is common to get higher and more irregular fever, occasional rigors, and in general, more serious symptoms

CONSTIPATION —This is usual, and is more obstinate if there be local peritonitis affecting the neighbouring coils of intestine

The *pulse* is not of much diagnostic value It may remain steady and slow in spite of acute inflammation of the gall bladder, the pres ence of biliary calculi or even local peritonitis A rapid pulse in cholecystitis may be indicative of severe toxæmia either from extend ing peritonitis or merely from toxic substances absorbed from the bile ducts and gall bladder

JAUNDICE —This is not usual in cases of simple cholecystitis, nor is it the rule even when gall stones are present, but there is frequently a history of jaundice occurring after previous attacks of acute abdominal pain This would suggest the previous passing of a gall stone

Differential diagnosis

Cholecystitis is most commonly mistaken for *appendicitis*, or an *inflamed duodenal ulcer*

The symptoms—pain, vomiting, constipation, fever, leucocytosis—are very similar to those of *appendicitis*, but the site of localized pain is in the one case in the right hypochondrium and in the other in the right lumbar or iliac regions If any swelling be palpable its continuity with or distinction from the liver is of prime importance in diagnosis It must be allowed that there are some cases, especially in fat subjects with a rather low lying inflamed gall bladder accompanied by local peritonitis and rigidity, in which a definite differentiation from appendicitis with local abscess is almost impossible before operation A previous history of jaundice or biliary colic may be of assistance, or an account given of previous attacks suggestive of appendicitis might point to that disease It must not be forgotten that it is not unknown for the two diseases to occur simultaneously

INFLAMED OR LEAKING DUODENAL ULCER

In the case of a duodenal ulcer which is threatening to perforate or has even leaked slightly, the local findings may be similar to those of cholecystitis with local peritonitis, but a careful inquiry into the *history* will distinguish The pain which comes on about two and a half hours after meals and is relieved by taking food, the bringing up of "water brash' and acid eructations, the attacks of flatulence, and possibly the occurrence of melæna may give a clear picture of ulcer If time permits, the diagnosis of ulcer may be confirmed by noting deformity of the duodenal cap and a rapid emptying of the stomach as observed by X rays after administration of a barium meal

RETROPERITONEAL PERFORATION OF DUODENAL ULCER

Retroperitoneal perforation of a duodenal ulcer may be attended by severe collapse at the onset, but the condition quickly localizes and leads to tenderness and swelling in the right loin The perinephric tissues become œdematous and there may be frequency of micturition and even hæmaturia from the irritation of the renal pelvis There is great pain on pressure at the erector costal angle The diagnosis is difficult, since a primary renal condition is likely to be suspected It is, fortunately, a very rare condition

BILIARY COLIC

Biliary colic (unassociated with inflammation of the gall bladder) is distinguished from cholecystitis by its more acute onset more paroxysmal and agonizing pain, and by the greater accompanying collapse The abdominal wall over the gall bladder is soft and yielding though there may be local deep tenderness The pain is usually radiating being felt specially in the right subscapular area It may also be felt on the left side in which case there may be a complaint of a sense of constriction round the waist This feeling of constriction when present is very characteristic of biliary colic A subnormal temperature is more common than fever, and transient jaundice is common *after* the attack

RUPTURE OF THE GALL BLADDER

With rupture of the gall bladder or of one of the bile ducts there are usually the history and symptoms suggestive of biliary colic or cholecystitis, with a gradual extension of the painful area downwards until the whole abdomen is tender, distension of the intestines increases and there is tenderness on rectal examination Free fluid may sometimes be demonstrated There is often a history of acute onset, with a subsequent remission of symptoms for a day or two and a final exacerbation of symptoms as the peritonitis spreads over the abdomen

RUPTURE OF THE BILE DUCT

With retroperitoneal rupture of the bile duct the symptoms and signs remain localized to the right side of the abdomen, and there is sometimes an irritation of the renal pelvis causing pain on or frequency of micturition There is rigidity and tenderness of the right lower abdomen, and there may be pin stroke hyperæsthesia just above the right inguinal ligament This rare condition is before operation almost impossible to distinguish from cholecystitis or appendicitis

HEPATITIS

In hepatitis there is tenderness all over the liver including *the lateral aspect* as ascertained by pressure in the lower intercostal spaces laterally as well as in the right hypochondrium This sign serves for diagnosis except in those cases where hepatitis coexists with the cholecystitis

PLEURISY

In right basal pleuro pneumonia or diaphragmatic pleurisy fever

is usually higher (104° F or 105° F), there may be an initial rigor, the right hypochondriac tenderness is more superficial, and by gradual coaxing the fingers may be pressed well into the subhepatic region and there should be signs—at any rate fine crepitations—at the base of the right lung and pleura Pain on top of the right shoulder would be much more likely to be met with in diaphragmatic pleurisy than in cholecystitis The occurrence of hæmoptysis in any doubtful case would suggest either pneumonia or pulmonary infarct

XVI

THE COLICS

TRUE ABDOMINAL colic is always caused by the violent peristaltic contraction of one of the involuntary muscular tubes whose normal peristalsis is quite painless The violence of the contraction is usually produced in an effort to overcome some obstacle which prevents the passage of the normal excretion or secretion The pain is due to the stretching or distension of the tube and the agony produced may be as severe as any to which a human being can be subjected

The involuntary muscular tubes which may thus cause colic are

The stomach and intestines
The cystic, hepatic, and common bile-ducts
The pancreatic duct The ureters
The uterus and Fallopian tubes

The main feature of severe colic is the occurrence of acute agonizing spasmodic pain, which doubles up the patient It is associated in varying degree with the symptoms consequent on shock due to excessive stimulation of the sympathetic nervous system, e g pallor or lividity, weak pulse, vomiting subnormal temperature or coldness of the body surface The pain is referred partly to the local site of origin and partly to the area of nerve distribution of the segment of the spinal cord with which the affected part is associated The abdominal muscles *in common with many other of the voluntary muscles* may remain contracted and rigid during the height of the pain, but they relax when the spasm of pain subsides and the fingers may then be pressed fairly easily into the abdominal cavity, though there may be local tenderness over the affected viscus

In the general diagnosis of a colic the following points may help

1 In colic *the patient is usually very restless, and flings himself about as if to find some relief from the pain which grips him* A flexed position of the body may be adopted during the pain

2 In colic pressure to the abdomen sometimes relieves the pain—an occurrence not usual in other acute conditions

3 The pain usually comes in paroxysms lasting a variable time

4 Though occasionally rigid during the paroxysms the abdominal wall *is soft between the bouts of pain In sudden acute peritonitis it* remains rigid all the time

3. In many of the colics the pain-distribution is almost diagnostic. (Fig. 35.)

INTESTINAL COLIC

Colic of the small intestine is sometimes caused by catarrhal enteritis due to the ingestion of improper food, or the toxins of some fevers. It is met with in more severe degree in that rare condition termed "enterospasm," and in cases of organic obstruction to the small

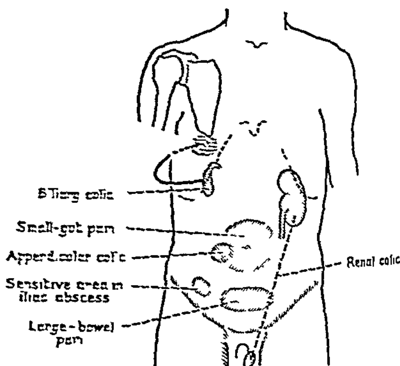


Fig. 35.—Diagram to show common sites to which pain is referred in the various forms of colic. (See also Fig. 2 on page 6.)

intestine. The pain is acute and griping, is referred to the epigastric or umbilical region, and is accompanied sometimes by local areas of distension where gurgling sounds may be heard and sometimes felt by the palpating hand. Vomiting may take place, and peristalsis may occasionally be seen through the abdominal wall. When due to enteritis the pain is generally soon followed by diarrhœa, the nature of which may give the clue to the cause of the pain. When due to organic obstruction the attacks will occur from time to time till a final attack of acute intestinal obstruction occurs. Enterospasm cannot well be distinguished from organic obstruction. When severe pain, as used to be

due to intestinal colic, persists for more than three or four hours the condition is generally one needing surgical intervention

Lead colic is a form of colic of the small intestine which is accompanied by constipation The pain may be extreme and the collapse of the patient severe During the spasms of pain the abdominal wall may be rigid Other signs and symptoms pointing to lead poisoning (blue line on gums, severe constipation local paralysis, etc) may be present and the patient s occupation is usually that of a painter, or one who comes in contact with paint

Colic of the large intestine is very frequent but the pain occasioned by the large bowel is seldom so acute or prostrating as that resulting from colic of the small bowel The pain is referred chiefly to the hypogastrium The causes are either severe constipation due to hard scybalous masses colitis or dysentery, or some form of stricture of the large bowel Pain in the colon is often more accurately localized by the patient than is the pain of small bowel colic

Diagnosis

In any case of intestinal colic diagnosis is greatly aided by the history for the history of eating tainted food or the knowledge that similar attacks have occurred in other members of the household the occurrence of previous similar attacks in one who is a painter by trade or an account given of former bouts of dysentery may throw considerable light on the problem By obtaining a careful history it should also be possible to exclude appendicular colic The occurrence of diarrhœa would usually exclude inte tinal obstruction but it must be recollected that loose motions are sometimes seen with an intussusception (q v) Local or diffuse peritonitis must be excluded by noting the absence of rigidity when the severe pain subsides, the relief obtained by gentle pressure on the abdomen and the absence of tenderness of the pelvic peritoneum

If attacks of small intestine colic recur from time to time and lead to loss of weight, the possibility of organic obstruction (by adhesions, bands tuberculous stricture or neoplasm) must be considered nor is it wise to delay too long before advising radiographic examination of the intestinal tract Tuberculous mesenteric glands frequently lead to subacute attacks of intestinal colic, and in these cases a radiograph may show evidence of calcification of the glands

Similarly when there are recurrent attacks of distension of the large bowel accompanied by colic and constipation it is wise to suspect carcinoma or stricture of the colon or rectum and certainty on the question must be obtained by the proper diagnostic procedure (see Chapter X)

5 In many of the colics the pain distribution is almost diagnostic (Fig 35)

INTESTINAL COLIC

Colic of the small intestine is sometimes caused by catarrhal enteritis due to the irritation of improper food, or the toxins of some fevers It is met with in more severe degree in that rare condition termed "enterospasm," and in cases of organic obstruction to the small

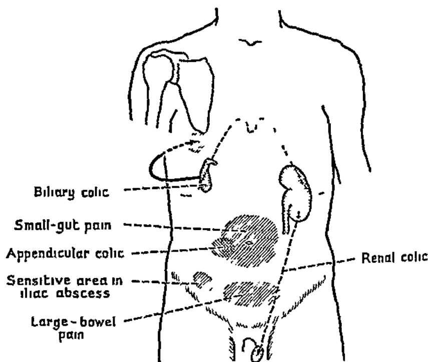


FIG 35 —Diagram to how common sites to which pain is referred in the various forms of colic. (See also Fig 2 on page 6)

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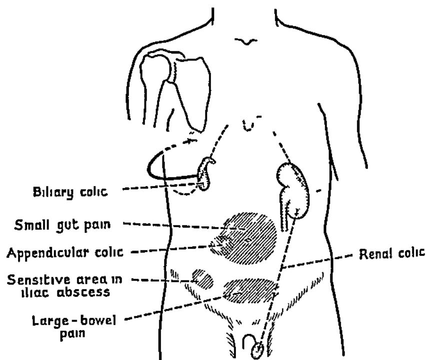


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BILIARY COLIC

Biliary colic is caused by the passing of a stone or inspissated bile through the cystic hepatic, or common bile ducts It varies considerably in intensity according to the difficulty which the stone experiences in traversing the ducts The pain is usually sudden in onset and severe in intensity Vomiting is common and collapse may be so severe that the observer may consider the patient *in extremis* Occasionally death has actually occurred during an attack of biliary colic, and the writer has known one such case but *fortunately this event is exceedingly* rare Generally the patient writhes in agony but in the worst cases may lie still with pinched, blue face, cold extremities, and weak pulse The pain is felt

1 *In the right* hypochondrium which is usually tender on pressure
2 Below the inferior angle of the right scapula
3 Occasionally at the same levels on the other side of the body
4 *Infrequently it may be referred to the right acromial and lower* cervical region

The *common position of the pain corresponds to the distribution* of the nerves from the eighth and ninth dorsal segment of the spinal cord

Jaundice is not a necessary accompaniment of biliary colic but in slight degree it is a frequent sequel

Diagnosis

Diagnosis is usually fairly clear on account of the intensity and distribution of the pain and the absence of local abdominal rigidity when the pain passes off *When rigidity persists* in the right hypochondrium there must be accompanying *cholecystitis or local peritonitis* A leaking or inflamed duodenal ulcer also causes persistent rigidity, but in the case of ulcer there should be a definite history suggestive of that condition (see Chapter XV)

RENAL COLIC

Renal colic is caused by the passage of a small stone, a portion of blood clot or inspissated pus, oxalate crystals or uratic débris down the ureter, by the impaction of a stone in the renal pelvis and sometimes by sudden kinking of the uretero pelvic junction when there is an unduly mobile kidney It is sometimes *but by no means* always accompanied by hæmaturia

The symptoms are usually characteristic The patient is seized with sudden pain starting in the loin and often radiating to the corresponding testicle or groin or (in women) to the vulva In some cases there

is extensive superficial hyperæsthesia of the abdominal wall either in front or posteriorly In severe cases there is violent restlessness Vomiting is common There may be frequency of urination and pain on performing the act Hæmaturia may accompany or follow the pain Renal colic in males by no means always radiates to the testicle and it must be remembered that pain due to inflammation of the appendix is sometimes felt in the testicle

Diagnosis

The distribution of the pain is characteristic and local examination of the loin may reveal a tender and possibly enlarged kidney An X ray examination may show a stone to be present but there are many cases of renal colic in which no stone is seen by the X rays yet a small stone is passed later Minor degrees of ureteric colic are frequently misdiagnosed appendicular colic especially when a radiograph is unsuccessful in revealing the small calculus

UTERINE COLIC DYSMENORRHŒA

The pain caused by the uterus in its attempt to expel either a fœtus a polypus a membranous cast or even blood-clot may be very severe The pain is referred chiefly to the lower lumbar region but in severe cases it may radiate down the thighs and over the hips Vomiting and retching may occur

Spasmodic dysmenorrhœa may cause the patient to writhe Since with any abdominal pain in women the menstrual history would be inquired into and with spasmodic dysmenorrhœa vaginal and pelvic examination would show no special reason for pain of uterine origin (apart perhaps from a pin hole os and small cervix) there should be little difficulty in diagnosis

GASTRIC COLIC

Attacks of severe epigastric pain of a colicky nature sometimes occur in those who are the subject of pyloric stenosis due to ulcer or neoplasm In such cases the peristaltic wave can often be seen going from (the patient s) left to right and the outline of the dilated stomach may readily be recognized through the abdominal wall The pain is referred to the area of distribution of the tenth dorsal segment chiefly on the left side

Severe pain may also be caused by a sudden hæmorrhage taking place into the stomach In such cases there is usually a history suggestive of gastric ulcer The severe pain and collapse and epigastric tenderness may lead one to diagnose intestinal obstruction or gastric

perforation But the sudden anæmia the vomiting of altered blood (which usually occurs) and the lax abdominal will give the clue to the correct diagnosis

PANCREATIC COLIC

Very occasionally obstruction to the duct of Wirsung may give rise to colic Severe pain sometimes radiating to the left shoulder, may be felt, and there will be symptoms of pancreatic derangement but the condition is probably rarely correctly diagnosed before operation

XVII

THE EARLY DIAGNOSIS OF ABDOMINAL INJURIES

Every case of abdominal injury which is obviously of a serious nature is nowadays removed to the care of the surgeon but since there are many cases in which though serious damage has resulted from the injury, the symptoms are not obvious and indeed may remain latent for some hours it is useful to summarize the main points in diagnosis

We shall confine ourselves to the consideration of those injuries in which there is no open wound of the parietes, for when a stab or penetrating wound of the abdominal wall exists there should be no question that the treatment is surgical

Non penetrating injuries of the abdomen are most commonly due to severe crushes as would follow from a heavy vehicle running over the abdomen Another type of violence is the sharp circumscribed blow due to a kick punch, or the sudden impinging of any hard body against the abdominal wall Severe injury may also follow the strain on the visceral attachments consequent on a fall from a height or a sudden trip up causing a violent fall forward When violence is applied against the abdominal wall the kind of injury produced depends to a certain extent upon the preparedness of the patient for the blow and the consequent rigidity or flaccidity of the abdominal muscles If the muscle is taken unawares more serious intra abdominal mischief is to be expected whereas if the muscle be rigid it may mitigate or prevent injury of the underlying viscera

Any injury of the abdominal wall however slight may be accom panied by serious lesions of the viscera and the latter may be seriously injured without any visible sign of injury to the abdominal wall When there is no external wound the thought of visceral injury may not be present in the mind of the observer and grave lesions may be allowed to progress considerably before they are noticed

The solid viscera of the abdomen (liver spleen pancreas kidneys) are situated high up in the abdomen largely under cover of the ribs the hollow tubes (intestines bladder, ureter and stomach) are more exposed to injury

Injury to solid viscera causes hæmorrhage injury to the hollow viscera usually causes peritonitis whilst both types of lesion may be accompanied by shock

Shock and hæmorrhage

Shock is shown by pallor, feeble pulse, sweating slow shallow respiration and cold extremities, but unless there is some erious lesion the symptoms soon subside If the state of shock lasts longer and seems out of proportion to the evidence of intra abdominal injury examination may reveal a pneumothorax or other chest lesion In juries of the upper abdomen cause more serious shock than those of the hypogastric region Renal contusions also cause severe shock The observer should recollect that in a very shocked patient the reflexes are diminished and consequently rigidity of the abdominal wall may be absent even in the presence of peritoneal irritation (Bradford, B, *et al Ann Surg*, 1946 **123**, p 32)

If the symptoms of shock do not pass off within six hours, hæmorrhage or peritonitis is almost certainly an additional factor

HÆMORRHAGE—Owing to the anatomical disposition of the parts hæmorrhage usually follows lesions of the upper zone in which lie the liver and spleen The main abdominal vessels are more likely to be injured by violence directed against the central portion of the abdomen When the liver or spleen is severely torn, the symptoms of shock *and hæmorrhage are extreme, and death frequently follows soon after* the injury In lesser degrees of injury of the solid viscera (or of the mesenteric blood vessels) evidences of bleeding gradually assert themselves Increasing restlessness, and pain, progressive pallor of the lips and finger nails a rising pulse rate and the demonstration of movable dullness in the flanks are sufficiently indicative Occasionally the symptoms of hæmorrhage may abate for a day or two and then become alarmingly evident after some exertion, e g straining on the bed pan *This is more likely to occur after injuries to the spleen* The pulse rate is a good but by no means infallible guide in abdominal hæmorrhage It may continue fairly slow (not above 100) till the abdomen is full of blood and then suddenly bound up to a rapid rate Presumably the increase in rate takes place when the cardio vascular compensating mechanism fails

The significance of pain on top of the shoulder due to irritation of the diaphragm has been referred to in an earlier chapter It is well known that rupture of the spleen *may be indicated by pain on top of* the left shoulder Similarly shoulder pain may follow a wound of the liver John Hunter noted this in his account of gun shot injuries (edition by J F Palmer Vol III page 560) 'From a wound *in the* liver there will be pain in the part of a sickly or depressing kind, and if it is in the right lobe there will be a delusive pain in the right shoulder, or in the left shoulder from a wound in the left lobe "

Contusion or rupture of the kidney is frequently accompanied by

very severe and alarming shock, which generally passes off within an hour or two (e g the "kidney punch" in boxing) The later symptoms depend on the extent of the injury and the condition of the renal capsule In slight cases where the capsule remains intact hæmaturia local tenderness, and sometimes renal colic due to the passage of clots down the ureter, comprise all the symptoms If the renal capsule be torn a retroperitoneal hæmatoma is formed, and sometimes urine is extravasated into the cellular tissues behind and around the kidney this leads to cellulitis accompanied by malaise, irregular fever, and local swelling, tenderness and muscular resistance An abscess may result If the urine be infected the symptoms are more acute Should the peritoneal covering of the kidney be torn, symptoms of intra peritoneal hæmorrhage will result Most cases of hæmaturia resulting from renal contusion stop spontaneously, but a rising pulse rate accompanied by continuing hæmaturia or by an increasing retro peritoneal peri renal swelling, calls urgently for exploration

Peritonitis

Peritonitis is usually the result of rupture of the hollow viscera The intestines, bladder and stomach are most commonly injured, the gall bladder and ureters rarely Sometimes the injury is only sufficient to bruise the walls of the viscus If the stomach be thus contused the result is vomiting and sometimes hæmatemesis, if the colon be bruised the passage of blood per anum and diarrhœa due to traumatic colitis may follow

Bruising of the bladder causes slight hæmaturia, but if the contusion be severe there may be vomiting and local muscular rigidity, even though no rupture has occurred

RUPTURE OF INTESTINE.—This is the commonest cause of periton itis after abdominal injury it is a condition fraught with danger of almost certain death if not diagnosed early yet the signs and symptoms are often equivocal for some hours Generally the tear only involves a portion of the circumference of the gut but occasionally a complete severance is caused and a gap left between the two ends which may be temporarily closed by contraction of the involuntary intestinal muscle When intestine is injured its peristaltic movements stop owing to a reflex or direct paresis of its walls If the rent be small the edges of the mucous membrane pout and fill the small gap, a small amount of intestinal contents escapes and sets up a local plastic peritonitis with deposit of lymph which glues together the coils of intestine The patient takes nothing by the mouth and the gut remains at rest A lull in the symptoms gives a false security After a few hours when the observer may have decided that there is no serious intra abdominal lesion, food

is taken, the intestines are excited to peristaltic contraction and the opening in the gut is unsealed Peritonitis then develops more or less rapidly according to the size of the opening and the number of ad hesions

The important earlier signs of peritonitis are

Pain Local tenderness Local muscular rigidity
Vomiting Shallow abdominal respiration

The later evidences of peritoneal infection are

Elevation of pulse rate and temperature Increasing distension
Tenderness of pelvic peritoneum *Movable* dullness in the flanks
Obliteration or diminution of liver dullness (caused by gas in front of the liver)

The patient often has an anxious facial expression and may show unusual restlessness In injuries of the upper abdomen importance must be attached to the shifting of the pain to the hypogastrium due to the inflammation caused by the escaped intestinal contents which gravitate to the pelvis The absence of intestinal sounds on repeated auscultation of the abdomen would be in favour of some intestinal injury

A plain X *ray photograph of the abdomen* may be useful by showing free gas localized near a ruptured portion of gut

The prognosis in cases of ruptured intestine is very bad unless diagnosis is made and operation undertaken soon after the injury Hence the need for early diagnosis

Provided there be no lesion in the chest, and that renal trauma can be excluded one is probably dealing with a case of ruptured intestine in the following conditions

1 When severe abdominal pain persists for more than about six hours after an injury and is accompanied by any of the following

(*a*) vomiting especially bilious vomiting,
(*b*) a pulse *gradually rising from the normal*
(*c*) persistent local rigidity tending to extend,
(*d*) deep local tenderness with shallow respiration

2 When abdominal pain is absent or very slight and anæmia is not increasing, but the pulse rises steadily hour by hour, and *the patient* is very restless or listless

When marked diminution of the liver dullness occurs with any of the above symptoms or if there be signs of free fluid in the abdomen, or rectal examination shows the pelvic peritoneum to be very *tender*, the indications for operation would be imperative

It is assumed that opening the abdomen would be advised

without any delay if the symptoms of peritonitis were quite typical

It is possible for the duodenum and parts of the colon to be ruptured behind the peritoneum The symptoms are then due to a retroperitoneal cellulitis, with some inflammation of the contiguous peritoneum, viz. local pain and muscular rigidity, shallow respiration vomiting rise of pulse rate and of temperature In a case of retroperitoneal injury to the duodenum which was under my care the pain at first was very slight but became greater hour by hour till I felt constrained to open the abdomen though there were few local signs to guide me A very important diagnostic sign (when present) is surgical emphysema of the retroperitoneal tissues

RUPTURE OF THE URINARY BLADDER —This usually occurs in connexion with fractured pelvis but may result from a blow on the hypogastrium when the viscus is distended In children the bladder is situated higher up in the abdomen and is therefore more liable to injury The symptoms vary according as the rent is intra or extra peritoneal If within the peritoneal cavity, symptoms of peritonitis ensue, but it must be remembered that sterile urine does not at first cause a very acute inflammatory reaction There may be hæmaturia

Rupture outside the peritoneum tends to extravasation of urine and consequent cellulitis in the suprapubic and perineal regions

In a child with fractured pelvis the membranous urethra may be torn completely across and the neck of the bladder with the torn portion of attached urethra may retract from the triangular ligament In such cases the bladder sphincter may remain contracted and the viscus become over distended A tense and tender swelling will thus be detectable in the hypogastrium The tenseness and tenderness of the lower abdomen thus produced may cause the diagnosis of peritonitis to be made erroneously

RUPTURE OF THE STOMACH —This quickly leads to symptoms of general peritonitis it is generally accompanied by ome other lesion such as injury to the spleen or liver The part of the stomach likely to be ruptured by injury is that part which is seldom the site of ruptured ulcer i e the greater curvature The gas which escapes may for a time be localized and form an area of superficial tympanitic resonance on percussion

The pancreas is rarely injured and the symptoms of such injury are in no way distinctive Increasing epigastric pain would tend to spread lower down the abdomen Shock is always great The condition is usually associated with other injuries

Diagnosis of abdominal injuries

The essential point in diagnosis is to estimate the different propor

tions which shock, hæmorrhage and peritonitis take in the production of the observed symptoms, and to judge from this the viscus injured and the nature of the lesion

It is frequently impossible to give a definite opinion for a few hours after the accident Initial shock usually subsides within two or three hours, and then symptoms of hæmorrhage or peritonitis become increasingly evident *If shock is still present after three hours there* is nearly always some serious visceral lesion Pain, vomiting, local or general muscular rigidity, tenderness, alteration of pulse rate shallow respiration, diminution of liver dullness, free fluid in the abdomen—these are the main symptoms to note By taking into consideration the part of the abdomen struck, it is possible in many cases to say which viscus is injured and what is the nature of the injury

In cases of suspected rupture of the bladder two additional means of diagnosis are available

1 The bladder is emptied by a catheter and a measured quantity of boric acid or saline solution is introduced and again drawn off Any serious discrepancy between the amounts put in and drawn out suggests rupture of the bladder

2 Cystoscopy may show a rent in the bladder, but this should only be carried out by an expert in the use of the cystoscope

Differential diagnosis

It is very important always to *examine the thorax carefully* for pneumothorax or hæmopneumothorax Symptoms very suggestive of serious abdominal injury may be produced by either of these lesions Abdominal pain and rigidity and the general signs of shock and hæmorrhage may follow a fracture of rib with rupture of lung and consequent presence of blood and air in the pleural cavity *Hence the* need of careful thoracic examination In cases of doubt radiography of the chest by means of a portable X ray apparatus, would clearly show whether there were a pneumothorax

XVIII

THE ACUTE ABDOMEN IN THE TROPICS

IN TROPICAL climes there are several common acute abdominal conditions which are seldom seen in temperate regions For the most part these are the manifestations of malaria and dysentery Some of the most common are

Hepatitis (amœbic or malarial) *Acute liver abscess*
Rupture of liver abscess *Dysenteric typhlitis*
Acute or subacute dysenteric perforation
Perforation of a typhoidal ulcer *Abdominal pain in sickle-cell anæmia*

Pain in the right upper quadrant of the abdomen which in temperate climes usually indicates cholecystitis or duodenal ulcer in the tropics frequently means either amœbic or malarial hepatitis

AMŒBIC HEPATITIS

It is essential for the practitioner in the tropics to have a sound knowledge of the symptoms of amœbic hepatitis since it is the first stage towards amœbic abscess of the liver, and prompt and early recognition and treatment of the hepatitis will save many a patient from the inconvenience and danger of surgical interference

Hepatitis may develop during the course of an acute amœbic colitis or it may come on at a period remote from the dysenteric attack The amœbæ travel to the liver via the radicles of the portal vein, and, lodging in the portal capillaries cause extensive inflammation

Symptoms

There are five constant features and many inconstant symptoms to be looked for in amœbic hepatitis The constant features are

1 Fever 2 Enlargement of the liver
3 Pain and tenderness in the hepatic region
4 Leucocytosis 5 Reaction to emetine

The common though inconstant features are

6 History of dysentery 7 Jaundice
8 Pain in the right shoulder region or in the iliac region
9 Rigor 10 Lassitude and malaise
11 Foul tongue 12 Sweating

The occurrence of fever, with an enlarged painful liver, in a person who is or has been living in a tropical country, should always lead one to suspect amœbic hepatitis, whether there is a definite history of amœbic dysentery or not The occurrence of leucocytosis (15 000 to 20 000) is corroborative evidence The presence of any of the inconstant symptoms may be taken as confirmation The diagnosis is always clinched by the rapid, often dramatically rapid subsidence of symptoms under treatment by hypodermic injection of emetine hydrochloride one grain daily for ten days The symptoms begin to abate after the administration of two or three doses

Differential diagnosis

There are several pitfalls that lie in wait for the unwary *Malaria* may cause a hepatitis with jaundice This can be excluded by examining the blood for the malarial parasite Cholecystitis may be wrongly diagnosed because the pain may be most evident in the gall bladder region If the pain be also referred to the right iliac region there is a simulation of appendicitis *In a tropical country it would be a wise procedure for the surgeon to try the effect of a short course of emetine before operating on any but the most fulminating types of appendicitis and cholecystitis*

PAIN IN THE RIGHT LOWER QUADRANT

Acute pain in the right lower quadrant of the abdomen when occurring in a patient residing in a temperate clime is usually due to appendicitis In the tropics, however, one must also consider (in addition to hepatitis)

Dysenteric typhlitis *Leaking hepatic abscess*
Cæcal perforation with local abscess

The insidious nature of amœbic colitis permits considerable pathological lesions to exist without many symptoms Ulceration in the cæcum is frequently accompanied by considerable swelling of the gut but may be unaccompanied by any dysenteric symptoms—on the contrary constipation may be the complaint If then in such a case pain is suddenly complained of in the right iliac fossa, the temperature becomes elevated and vomiting occurs, and on examination a tender lump is found in the appendicular region the conditions for a false diagnosis are evident The surgeon practising in the tropics must not be too ready to operate on painful swellings in the right iliac fossa The examination of the fæces for amœbæ and the trial of treatment by emetine for two or three days, are useful and often necessary preliminary procedures for operation on cases of amœbic typhlitis is fraught with peril

Perforation of the cæcum may take place insidiously, and adhesions may limit infection to the iliac fossa Such cases, apart from the history, are almost indistinguishable from those of appendicular abscess

Since local abscess will need to be opened, the actual mistake as to the cause of the abscess makes little difference save that more rapid healing will ensue if emetine is simultaneously given in cases of amœbic dysentery

Simulation of appendicitis by a leaking hepatic abscess is a rare event but an instance has come under my observation

GENERAL ABDOMINAL PAIN

General abdominal pain may be produced in the tropics by the usual causes described in the different chapters of this book but in addition one may have to deal with

Rupture of liver abscess into the general peritoneal cavity
Rupture of dysenteric ulcer Rupture of typhoidal ulcer
Cholera sicca Ruptured spleen

RUPTURE OF A LIVER ABSCESS —Rupture of liver abscess into the general peritoneal cavity is not common but is sufficiently frequent to bear in mind as a possible cause of the acute abdomen It would give rise to all the symptoms of diffuse peritonitis (q v) and unless the patient was known to have been suffering from recent liver disease it is unlikely that the proper diagnosis would be made before the abdomen was opened

RUPTURE OF A DYSENTERIC ULCER INTO THE PERITONEAL CAVITY —The most common sites for perforation are the cæcum and sigmoid colon Consideration of the grades of acuteness of the amœbic ulceration will explain partly the difference of symptoms which may result after perforation In the acute type of inflammation in which masses of the mucous membrane are cast off as gangrenous sloughs there is little reaction in the bowel wall and ulceration may penetrate through to the peritoneal coat before time has been allowed for protective adhesions to form In such cases when the bowel finally gives way the peritoneal cavity may suddenly be flooded with fæcal material and fatal general peritonitis rapidly ensue

If, however the ulcer is subacute and the wall of the colon only permits a gradual erosion there may be time for omentum or intestine to adhere to the peritoneum covering the base of the ulcer Adhesions may therefore prevent the rupture, or may surround the diseased area so that when rupture takes place, the escape of gut contents is into a limited space A localized abscess then results

There is an intermediate type of lesion in which perforation may not occur, but an escape of organisms may take place through the thinned ulcer base into the peritoneal cavity, though there is no general escape of intestinal contents, and the base of the perforating ulcer is very soon sealed up by adhesions

The *symptoms* produced by perforation in a case of dysentery will vary in severity according to pathological type

(*a*) If fæcal flooding of the general peritoneal cavity occurs, the symptoms indicating the catastrophe will be an onset or increase of abdominal pain vomiting, collapse, rising pulse rate distension, and abdominal wall rigidity In patients who are exhausted by the dysenteric condition, and in whom abdominal pain and distension have been considerable, rigidity may not be a marked feature and the exacerbation of symptoms may not easily be distinguished from the collapse of severe toxæmia

(*b*) If the leakage is gradual, and adhesions occur, the signs of local abscess will develop

(*c*) In the intermediate type the symptoms will be those of subacute peritonitis

RUPTURE OF A TYPHOID ULCER —This may occur in some cases of ambulatory typhoid fever, so that a person previously supposed to be in fair health may be brought in with symptoms of peritonitis of recent origin The symptoms would at first be more evident in the lower abdomen since it is usually in the ileum that the perforation occurs Unless there were a history suggestive of the onset of typhoid fever it is unlikely that the condition would be distinguished from appendicitis with pelvic peritonitis Correct diagnosis might be made, however, if the spleen were felt to be enlarged, if there were any of the typical "rose spots to be found on the skin of the abdomen or if a leucopenia rather than a leucocytosis were found in a blood film

RUPTURE OF SPLEEN —In tropical and subtropical countries where malaria is endemic there are many of the population who have enlarged spleens Slight trauma may occasionally cause rupture of such an enlarged spleen, and rarely rupture may occur spontaneously

The symptoms would be collapse and the signs of intern[illegible] rhage The only hope of cure would be by operation t[illegible] spleen

CHOLERA SICCA —There are some cases of cholera patient is seized with violent abdominal pains and [illegible] severe toxæmia which may cause death before th[illegible] frequent and characteristic Such an acute cond[illegible] simulate other forms of the acute abdomen dominal rigidity and the severity of the

guard and the prevalence of cholera would make one suspect the true cause Moreover in cholera sicca there is no rallying from the initial collapse If the patient live long enough the characteristic stools would appear and clinch the diagnosis

HEAT STROKE

In very hot seasons and in places where a number of heat strokes are occurring it is well to remember that the initial stage of some cases of heat stroke may show gastro intestinal symptoms It is very seldom, however, that there could be any mistaking these symptoms for an acute abdominal disease for there are always other symptoms—dry skin, hyperpyrexia mental dullness, etc —which would guide one correctly

ABDOMINAL SYMPTOMS DUE TO SALT DEFICIENCY

In tropical climes as a result of the great heat and consequent excessive sweating there may result a state of salt deficiency This may give rise to severe cramps which may affect the muscles of the abdominal wall and cause such great pain collapse rigidity and tenderness that the observer may even diagnose the condition as one due to perforation of a peptic ulcer A quick test of the chlorides in the urine should be made and if there be serious deficiency salt should be administered promptly If the condition be due to deficiency of salt the symptoms then soon subside (Stening M J L 1945 *J roy nav med Serv* **31**, 129)

ABDOMINAL PAIN IN SICKLE CELL ANÆMIA

Severe abdominal pain may occur in patients (negroes) who suffer from sickle cell anæmia Crastnopol and Stewart state that the pain may be gradual vague, and generalized in onset or, on the other hand it may be acute excruciating and prostrating It may be accompanied by nausea vomiting rigidity and abdominal tenderness In all cases of acute abdominal pain of doubtful origin in negroes the blood should be examined

XIX

ACUTE ABDOMINAL DISEASE WITH GENITO-URINARY SYMPTOMS

ACUTE ABDOMINAL disease with genito urinary symptoms may be due to primary disease of the genito urinary organs or to secondary irritation of those organs consequent on disease of other viscera The main symptoms which may call attention are

1 Painful swelling *in the position of the kidney*
2 Renal colic
3 Disorders of micturition—pain frequency, retention
4 Abnormalities of urine—hæmaturia albuminuria
5 Pain in testicle or along spermatic cord
6 Tenderness at the right erector costal angle

PAINFUL SWELLINGS IN THE LOIN

A pyonephrosis or a hydronephrosis may give rise to acute symptoms In each case there will be found a rounded tender swelling in the loin The tumour will be felt to fill out the posterior lumbar region The colon may be felt to the front and inner aspect of the swelling but if the loin is well filled by the tumour that alone is usually quite sufficient *to diagnose a renal swelling In* both pyonephrosis and hydronephrosis there should be a history of previous urinary trouble *Acute attacks of pain are prone to occur in a recurring hydronephrosis*, and gastro intestinal symptoms (flatulence and vomiting) may accompany the attacks *If* seen during an attack however *the swelling is* characteristic In a pyonephrosis there are usually the signs of toxic absorption—fever, furred tongue, and a toxæmic appearance *With* a hydronephrosis the symptoms are less severe Sometimes it is difficult to obtain a history of renal symptoms and then it may be impossible by clinical examination alone to diagnose a pyonephro is with accompanying perinephritis from other causes of local suppuration such as appendicitis or diverticulitis—particularly in a fat patient

Polycystic disease of the kidneys may give rise to uræmia with vomiting and abdominal distension *This might be mistaken for intestinal obstruction*, but the presence of tumours in both loins *would make one suspicious*, and the occurrence of albuminuria and high blood pressure would make the diagnosis almost certain A polycystic kidney *usually has an irregular surface* due to the smooth cysts which vary considerably in size

RENAL COLIC

Pain of the type of renal colic may be caused by

Stone in pelvis of kidney *Stone in ureter*
Blood-clot or uratic débris in ureter
Dietl s crisis *Appendicitis*

In renal colic the pain starts in the loin and frequently radiates to the groin or to the corresponding testicle It may be due to anything solid or semi solid passing down the ureter, or to a sudden kink in the ureter due to a movable kidney (Dietl s crisis) There is usually no difficulty in diagnosis, though occasionally appendicular colic or even appendicitis may cause pain of a similar nature But in appendicitis severe enough to cause the simulation of renal colic there will usually be persistent local muscular rigidity which is not usually found in renal colic (See Chapter XVI)

DISORDERS OF MICTURITION

Pain on or frequency of urination is found in nearly all cases of pyelitis and in many cases of renal colic, but it is often also noted in appendicitis and other causes of pelvic peritonitis Examination of the urine will prove or disprove a pyelitis

In appendicitis pain on or a frequency of, urination may be due to irritation of the renal pelvis, ureter or bladder by the inflamed appendix or contiguous peritonitis When this symptom is accom panied by pelvic tenderness or a tender lump felt per rectum, or a positive obturator test, the appendix will usually be found in the pelvis irritating the bladder When unaccompanied by the other signs the appendix is generally either near the kidney where it may irritate the renal pelvis or at the brim close to the right ureter

In pelvic hæmatocele due to a ruptured ectopic gestation there are frequently urinary symptoms Sometimes there is retention of urine sometimes slight pain or frequency In a very anæmic woman with abdominal pain and urinary symptoms it is well to think of ectopic gestation Acute distension of the bladder may cause very severe hypogastric pain and sometimes pain in the lower lumbar region there should be no difficulty in palpating or percussing out the dis tended bladder and one must not be misled by the fact that urine may be passed by the process of overflow incontinence In those rarer cases in which the bladder does not distend upwards but rather backwards and upwards it may be difficult to make out its position by percussion but bimanual examination will determine it and the passing of a catheter will help the diagnosis

ABNORMALITIES OF URINE

Hæmaturia frequently follows renal colic and may sometimes enable one to trace to its source a renal pain that was not quite typical

Albuminuria is an exceedingly important symptom for uræmic symptoms may very closely simulate intestinal obstruction, and it may only be by the discovery of albuminuria that one is put on the right track Many patients with nephritis have undergone needless and harmful abdominal section because of neglect to test the urine Toxic albuminuria is found in many septic states of the abdomen but it is usually not difficult to judge when the toxæmia is severe enough to produce that symptom

TESTICULAR PAIN

Pain in the testicle is met with in renal colic and in a few cases of appendicitis In the latter instance it may either be due to irritation of the sympathetic branch which accompanies the spermatic artery, or be a true referred segmental pain across the tenth spinal segment

Torsion of the imperfectly descended testicle may cause extreme pain in the inguinal region and may simulate a strangulated inguinal hernia Vomiting occurs and shock may be severe The pain has the usual sickening character of testicular pain The absence of the testicle from the same side of the scrotum will be noted and make diagnosis easy

Thrombosis or suppurative phlebitis of the veins of the spermatic cord causes pain in the inguinal region and sometimes the iliac region of the abdomen But the swelling and painful area extend right down to the testicle, which becomes swollen and painful

Retraction of the testicle is occasionally noted in cases of appendicitis It is due to reflex contraction of the cremaster muscle

TENDERNESS AT ERECTOR COSTAL ANGLE

Tenderness on pressure at the right erector costal angle (i e the usual position for eliciting tenderness of the right kidney) is noted in many cases of appendicitis especially when the appendix is retrocæcal in position

Renal symptoms may be caused by any retro peritoneal lesion in the region of the renal pelvis thus a duodenal ulcer leaking posteriorly or a retro peritoneal perforation of the common bile duct may cause frequency of micturition or even slight hæmaturia

XX

THE DIAGNOSIS OF ACUTE PERITONITIS

APART FROM hæmorrhage the cause of death in nearly all fatal acute abdominal cases is either secondary peritonitis or acute paralytic or mechanical obstruction of the intestines Spreading or general peritonitis, with consequent toxæmia and secondary shock is the commonest single cause of death Most cases unless the patient is actually moribund, sooner or later demand an opening of the abdomen for drainage purposes At operation fluid may easily be obtained for examination but even before operation it is possible to obtain some by puncturing the abdomen in the midline midway between the navel and the pubis by means of a fine bore needle The exudate is stained for organisms and examined microscopically By noting the number and type of leucocytes and the amount of phagocytosis one may estimate the patient s resistance

Infective organisms may reach the peritoneum

1 Through a wound of the abdominal wall
2 Via the blood-stream
3 From the viscera contained within the abdomen
4 Rarely through the diaphragm or by lymphatic extension from the thigh

The only commonly blood borne organism of importance is the pneumococcus, which may cause severe so called primary peritonitis

Organisms may reach the peritoneum from the contained viscera either by (*a*) rupture of a viscus or (*b*) by escape through the diseased wall of any viscus In the female there is the additional path of infection via the Fallopian tubes Frequently a local abscess may form either extra or intra peritoneally near the diseased viscus and later such abscess may burst into the general peritoneal cavity

CAUSES

The common causes of general peritonitis are the conditions already described in previous chapters and comprise disease or rupture of the hollow viscera and ruptured abscess of the solid viscera

Perforation of

Appendix vermiformis Gastric or duodenal ulcer
Typhoid or tuberculous ulcer of small intestine

Dysenteric or stercoral ulcer or of a diverticulum of the colon
Gall bladder, or biliary ducts

Gangrene of
Strangled coil of gut, or intussusception, or volvulus

Infection spreading from
Pyosalpinx Infected uterus Pyonephrosis

Rupture of
Liver abscess Splenic abscess

SYMPTOMS

The symptoms of peritonitis vary greatly according to the part and extent of the peritoneum involved, the nature of the infective agent and the acuteness of onset Help in diagnosis will be obtained by regarding the symptoms as being roughly grouped in two classes reflex and toxic

Reflex	Pain Vomiting Anxious facial expression Superficial hyperæsthesia
Reflex / *Toxic*	Alteration of temperature Collapse
Toxic	Distension Intestinal paresis General toxæmia

The importance in recognizing these two groups of symptoms lies in the fact that reflex symptoms are earlier in onset when a *demonstrative* part of the peritoneum is affected but may be delayed considerably when a *non demonstrative* part is affected The division of the peritoneum into these two parts is based respectively upon a relatively free or scanty cerebro spinal nerve supply The anterior and lateral parts of the abdomen are lined by peritoneum well supplied by somatic nerves which bring about brisk reflexes The pelvis and median portion of the posterior abdominal wall have a scanty cerebro spinal supply, and in consequence irritation of these parts causes minimal reflex symptoms

Toxic symptoms are nearly always late in onset There is indeed an inverse relationship between the two groups, since severe toxæmia diminishes the sensibility of the reflex arc It thus follows that when a non demonstrative part of the peritoneum (e g the pelvic) has been primarily affected reflex symptoms may be minimal throughout, for

oncoming toxæmia diminishes the reflexes from the demonstrative part as it becomes progressively involved *Unless this fact is appreciated it is easy to overlook a pelvic or central peritonitis until the infection has advanced to a serious extent*

It will be noticed that two symptoms—collapse and alteration of temperature—are included in both groups Collapse, by which we mean obvious and rapid depreciation of the circulation and metabolism, may be seen either early or late in the course of peritonitis In the early stage it is a reflex symptom, whilst later in the course of the disease it is the result of absorbed toxins The early reflex collapse is usually quickly recovered from, though occasionally toxic collapse follows close on the heels of reflex collapse Early collapse is absent in those cases which have an insidious onset and is less likely to occur when the silent area of peritoneum is primarily involved

Alteration of temperature is common in peritonitis but is not sufficiently constant or regular to be of much aid in diagnosis Early collapse is accompanied by subnormal temperature whilst the ingravescent stage of the disease is usually indicated by fever of an irregular type In the later stages of peritonitis the temperature may be normal, subnormal, or slightly elevated

REFLEX SYMPTOMS

The early and reflex symptoms of peritonitis may in the absence of initial collapse be extremely equivocal They are more likely to be definite in young persons whose reflex arcs are normally more sensitive and conversely they may be insignificant in old and debilitated patients

Pain

Pain is the most constant symptom It may be confined to the local area of inflammation or referred more generally over the abdomen As the peritonitis extends the pain area also extends though the maximum pain is nearly always felt at the initial focus Tenderness is a constant feature over any focus of peritoneal inflammation Even when rigidity is absent there is usually pain felt on pressure over the affected site Only rarely have I seen this tenderness absent—either as the result of extreme toxæmia dulling the sensorium or as the result of extreme muscular rigidity which apparently prevented transmission of the applied pressure to the underlying inflamed area.

Vomiting

Vomiting is common at the onset of peritonitis but is usually

infrequent until late in the case The later vomiting is usually obstructive in character

The change in *facial appearance* though a guide to the experienced is something which cannot be indicated satisfactorily in words The white, drawn face of initial collapse will tell anyone that something serious has happened but collapse is by no means constant In any case, the reaction from initial collapse is so rapid and complete that the facial aspect commonly becomes and remains almost normal for a time But there is usually an indefinable yet perfectly definite aspect of countenance in many persons who may present an otherwise doubtful picture of peritonitis The Hippocratic facies present in late *peritonitis is merely that of extreme collapse*

Rigidity

Muscular rigidity is a common accompaniment of the early stages of peritonitis *but only when the part of peritoneum affected lies in the demonstrative area* It is best seen in perforation of a duodenal or gastric ulcer, whereby a large part of the demonstrative section of the peritoneum is irritated It is generally absent or but slightly demonstrable when the peritonitis is limited to the pelvis In those cases in which rigidity is present in the early stages the muscles relax as the peritonitis progresses until in the final picture it is almost absent Rigidity is also either absent or difficult to detect in fat people with flabby muscles and in old and weak patients Rigidity may be of slight degree in some cases of pneumococcal peritonitis and in some of the slowly advancing infections due to *Bact coli* (*Escherichia coli*) and streptococci *When sterile bile or urine leaks into the peritoneal cavity the resulting irritation may not be accompanied by rigidity of the abdominal muscular wall In cases of biliary extravasation several pints of bile may accumulate within the peritoneum before the increasing tumidity and distension and the presence of free fluid within the abdomen, reveal the serious nature of the condition*

Hyperæsthesia

Cutaneous hyperæsthesia is frequently seen in the subumbilical area of the abdomen in the region supplied by the tenth, eleventh and twelfth thoracic nerves It is more frequently seen on the right side Commonly it is limited to a narrow strip above each Poupart ligament

TOXIC SYMPTOMS

The toxic symptoms of peritonitis are later in appearance and indicate a more serious stage of the disease An occasional intermittence of the pulse is often one of the indications of advancing periton

itis As the infection involves the various coils of intestine they become paralysed and distended, whilst the intestinal contents stagnate and increasing obstruction results Poisonous substances are absorbed from the stagnating contents and secondary collapse results At this stage true obstructive vomiting is commonly a feature and there is noted the small running pulse commonly described as indicative of peritonitis Such a pulse is felt *in* the *latest* stages of peritonitis, and not in the earlier stages when diagnosis is so important

THE DIFFERENTIAL DIAGNOSIS

It is not difficult to diagnose a flagrant case of peritonitis, for the pain vomiting local tenderness, and muscular rigidity with fever sufficiently indicate the condition, but mistakes are likely to be made either because the symptoms are too slight or because they are atypical The early symptoms are slight and deceptive when the part primarily affected lies in the pelvis or in some other relatively silent area of the abdomen they are often atypical *in* patients who are old, debilitated or very fat In the late stages of peritonitis it is frequently impossible to differentiate from intestinal obstruction which develops as a late consequence of peritonitis We would take one more opportunity of emphasizing that the condition of the pulse is no true guide in diagnosing early peritonitis

The conditions which may simulate peritonitis are

Pleuro pneumonia *The colics* *Intestinal obstruction*
Internal hæmorrhage *Some nervous conditions, e g tabes hysteria*

The differentiating points will be found enumerated in other parts of this book

PRIMARY PNEUMOCOCCAL PERITONITIS

By primary pneumococcal peritonitis is meant that form of infection with the pneumococcus in which the peritoneal symptoms are the predominating feature of the illness It is fairly reasonable to suppose that the peritoneal lesion is nearly always secondary to some other focus in the body, but when that focus is latent or of minor importance it is customary to use the above term

Blood infection without any ascertainable focus of origin does occur but more frequently infection spreads from the Fallopian tubes or possibly from the intestine The disease is much more common in females under the age of ten

The symptoms vary considerably They are those of peritonitis of varying grades of severity One can with advantage describe three

stages to the disease—the stage of onset an intermediate stage, and a residual stage (Waugh)

ONSET

The stage of onset starts abruptly with abdominal pain vomiting and fever, which may reach 104° or 105° F In some instances there is noticeable diarrhœa Frequently there are toxic symptoms out of proportion to the local findings, and delirium may be noted

The abdominal pain may be diffuse, but is usually more definite in the hypogastrium The abdominal wall may be rigid, but more often is soft, and there may be but slight local tenderness

In the very severe cases, which are always septicæmic for a time death may occur within two or three days unless the condition is recognized and promptly treated

INTERMEDIATE STAGE

The intermediate stage corresponds to the formation of pus within the abdominal cavity The toxic symptoms lessen but irregular fever persists and there is a gradual tumescence of the abdomen (Waugh) Leucocytosis will be observed Abdominal pain in this stage is very slight, and the continued fever and a painless tumid abdomen may cause a suspicion of tuberculosis

RESIDUAL STAGE

The residual stage corresponds to the definite localization of pus and the absence of all acute symptoms save fever of an irregular type The pus may be in the pelvis or in the central part of the abdomen, or even in the subphrenic region

DIAGNOSIS

The diagnosis in the first stage has to be made from acute appendicitis This is sometimes very difficult, but if the initial fever be high if the abdominal signs be rather indefinite and especially if there be slight delirium and troublesome diarrhœa one should suspect pneumococcal peritonitis The condition occurs chiefly in young girls and some help may be obtained by examining the vaginal secretion for the pneumococcus since Fraser showed that the Fallopian tubes are the common route of infection Since penicillin has a specific effect upon the pneumococcus it may be given in large doses as a diagnostic test If the condition does not improve within a few hours or if there remain any serious doubt it is wiser to recommend exploration since more harm is likely to result from allowing a septic appendix to perforate than from exploring an early pneumococcal peritonitis

In the intermediate stage the continued fever, tumidity of the ab domen, and comparative absence of abdominal pain and tenderne s may lead to a suspicion of tuberculous peritonitis or even typhoid fever The history of onset, the palpation of any enlarged glands or masses in the abdomen or the positive result to a test for tuber culosis may help to diagnose the former, whilst the absence of leuco cytosis, an enlarged spleen, and a positive agglutination test would point to typhoid

In the third or residual stage a definite swelling will be detected in some part of the abdomen, this is a residual abscess and may be in the pelvis or upper or middle abdomen The diagnosis in this stage has to be made from the other causes of abdominal tumour and abcess The history of the previous illness will be of the utmost importance in deciding on a diagnosis

It has been mentioned above that pneumococcal peritonitis may not give rise to the muscular rigidity which is usual with most other forms of acute peritonitis I have known the combination of abdominal pain vomiting and lax abdomen give grounds for diagnosing acute intestinal obstruction

If there be coincident pleuritis or pericarditis the symptoms of peritonitis may be entirely overshadowed In the early stages of a pneumococcal polyserositis it is often very difficult to determine the exact diagnosis, but if definite signs declare themselves in the lung it would be inadvisable to recommend opening the abdomen until there are sufficient grounds for suspecting the presence of pus If the thoracic condition has been successfully treated, but the patient does not progress special care must be paid to the abdomen for the ab sence of rigidity and the comparatively slight pain may allow a con siderable collection of pus to go unobserved Waugh drew attention to the significant tumescence of the abdomen in these cases

The prognosis in cases of pneumococcal peritonitis has been greatly altered for the better by the fact that the organism is sensitive to some of the antibiotics (e g penicillin) and the sulphonamide group of drugs Early cases can be successfully treated by administration of penicillin and sulphadiazine and thereby operation may be altogether avoided

XXI

DISEASES WHICH MAY SIMULATE THE ACUTE ABDOMEN

THERE ARE a number of diseases which either do not need or positively contra indicate operative interference, which may yet cause symptoms very suggestive of conditions for which operation is the best procedure In some cases the symptoms arise from disease within the abdomen in other instances the pain is referred to the abdomen from another part of the body, e g thorax or spine

GENERAL DISEASES

It is not uncommon for abdominal pain and vomiting to occur at the onset of some of the specific fevers or of influenza, especially in children, but in such the general symptoms outweigh the local manifestations Fever will be present at the start and the general malaise is greater while locally there will not be found the tenderness or rigidity which suggest intra abdominal inflammation and it is by this discrepancy that the observer will be guided Occasionally the abdominal symptoms may precede the general manifestations of influenza, the pain may be of a severe colicky type, and if accompanied by vomiting may give rise to a suspicion of acute intestinal obstruction The vomiting never tends to become fæculent and soon the general symptoms of influenza appear During an epidemic of influenza one is more likely to mistake an acute abdominal condition for an attack of influenza with gastric symptoms—a serious mistake

DIABETES —Impending coma in diabetes is often accompanied by severe abdominal pain and vomiting There may also be some rigidity and tenderness of the abdominal wall The way is then clear for a mis diagnosis of acute inflammation within the abdomen and indeed *mistakes of this nature have been made*

In order to avoid such mistakes the first step is the routine examination of the urine for sugar If sugar is found the presence or absence of diacetic acid must be determined If a ketosis is found the abdominal symptoms and signs must be very carefully observed and appraised *If there be any serious doubt about the diagnosis* immediate steps should be taken to treat the ketosis by administration of insulin with glucose If the abdominal symptoms are entirely due to

a diabetic condition they will very speedily subside under this treatment If they do not show signs of subsiding the surgeon can be sure that there is a serious intra abdominal condition present

TYPHOID FEVER —This is sometimes accompanied by abdominal pain and local tenderness, especially in the right iliac fossa (see Chapter VI)

MALARIA —In tropical climes malaria frequently causes severe abdominal pain, but the type of fever and an examination of the blood easily enable one to diagnose

TUBERCULOUS PERITONITIS —This may cause vague abdominal pains, distension of the abdomen and free fluid These symptoms may occasionally give rise to the opinion that there exists some acute abdominal condition The gradual onset of symptoms the tumidity of the abdomen the lack of rigidity and tenderness and the presence of tuberculosis elsewhere in the body may be sufficient to lead to the correct diagnosis

It must be remembered however, that intestinal obstruction and perforative peritonitis sometimes occur in the course of tuberculous peritonitis, and these demand operative treatment Sometimes when the ileo cæcal region is extensively involved in the tuberculous process the gut may be adherent in the iliac fossa and the simulation of appendicitis may be very close There may also be superficial hyperæsthesia but in acute tuberculous peritonitis this is usually more extensive than in appendicitis, reaching occasionally well above the umbilicus

FOOD POISONING —This may give rise to abdominal pain vomiting and collapse There is a serious pitfall here Many patients who have a ruptured appendix or stomach attribute the trouble to the eating of some particular article of diet One may therefore miss a condition needing surgical intervention just as one may think an operation necessary when there is no need for interference In food poisoning the symptoms usually follow soon after eating some article of diet suspected to be tainted Frequently several people are simultaneously attacked In any case, though the general symptoms are similar, the local abdominal condition is unlike that of peritonitis (no rigidity) or severe obstruction (absence of fæculent vomiting) and there should usually be no difficulty in diagnosis if a careful watch be kept upon the case

BORNHOLM DISEASE —Bornholm disease or epidemic pleurodynia (epidemic myositis) sometimes has an onset which may cause it to be mistaken for an acute abdominal affection The disease chiefly affects the muscles of the shoulder chest and abdomen, which become painful If the abdominal muscles are chiefly affected a cursory examination

might lead one to suspect appendicitis, for there may be tenderness in the lower abdomen and superficial hyperæsthesia in the region of distribution of the ninth, tenth, and eleventh dorsal nerves There is slight fever and often headache and nausea sometimes diarrhœa Differential diagnosis should not be difficult since the muscle tenderness is found in the thoracic muscles also, and there is often pain on breathing and sometimes a pleuritic rub Moreover, it is usual for several cases to occur about the same time

BLOOD DISEASES

The only blood disease which I have ever known to cause simulation of acute abdominal disease is spleno medullary leukæmia The patient gave a history of prolonged indigestion, had suffered recently from irregular fever, and with an anæmic appearance presented also great tenderness, rigidity, and dullness in the left hypochondrium, so that the simulation of subphrenic abscess due to a leaking ulcer was rather close A leucocyte count, however, showed 240 000 white cells to the cubic millimetre and the true condition was recognized The acute local reaction was due to tension and threatening rupture of the spleen for spontaneous rupture took place shortly afterwards

Attacks of severe abdominal pain accompanied by vomiting (and sometimes diarrhœa) occur in some cases of pernicious anæmia but *seldom give rise to serious difficulty in diagnosis* We have elsewhere mentioned the acute abdominal pains which may occur during the course of sickle cell anæmia in negroes

ACHOLURIC JAUNDICE

It is well known that this disease is sometimes accompanied by abdominal crises in which acute abdominal pain nausea or vomiting, and tenderness on palpating the abdomen are noteworthy features The attacks coincide with an increase in the depth of the jaundice and intensity of the anæmia *It is likely that these attacks are due to slight* intra abdominal hæmorrhage, and in the absence of other indications there is little need to open the abdomen Removal of the spleen at a suitable time will free the patient from such attacks

THORACIC DISEASES

PLEURISY OR PLEURO PNEUMONIA —*Either of these conditions* may cause abdominal pain and rigidity, and may be accompanied by vomiting *In some cases it is quite* easy to distinguish by the signs present in the chest, but in children in whom the thoracic signs are often late in appearing, and in some cases of diaphragmatic pleurisy

in which few signs may be found, diagnosis is extremely difficult A summary of the main differential points will be found on p 180

An additional test is illustrated in Fig 36 If the pain be unilateral and of abdominal origin pressure from the opposite side of the abdomen towards the affected side will cause pain whilst if the pain be referred from the thorax no pain is caused by such pressure

ACUTE CARDIAC DISEASE —This frequently causes symptoms referable to the abdomen Epigastric pain and tenderness are common when the liver is congested and swollen from back pressure, vomiting is not an infrequent symptom in cardiac failure and severe collapse may usher in an attack of pericarditis or accompany acute cardiac failure I have on occasion been called to cases of endocarditis pericarditis and coronary thrombosis which were thought to be cases of abdominal disease Needless to say, in any case of doubt the circulatory system must be very carefully examined It is indeed seldom that any doubt remains after one has measured the cardiac and hepatic dullnesses listened to the cardiac sounds noted carefully the character and rate of the pulse and observed if there be any venous pulsation.

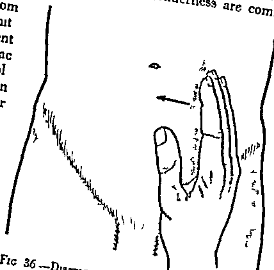


FIG 36 —Diagram to show the method of differentiating between right sided abdominal pain of thoracic and abdominal origin (Pressure from the left side causes pain if abdominal in origin.)

The only case in which I have known any reasonable doubt was that of a man of sixty to whom I was summoned in the middle of the night for a supposed perforation of a gastric ulcer The patient had been under treatment for a twelve month for gastric ulcer which caused frequent attacks of indigestion Sudden abdominal pain and collapse had supervened several hours before I was summoned I found the patient fully conscious very talkative but extremely distressed and short of breath No pulse could be felt at either wrist nor could the brachial arteries be felt to pulsate The heart was beating 160 to the

COMPARATIVE TABLE OF SYMPTOMS IN ACUTE ABDOMINAL AND ACUTE PLEURAL OR PNEUMONIC LESIONS

ABDOMINAL	PLEURAL OR PNEUMONIC
Previous History— Indigestion. Colicky pains Constipation Diarrhœa	Common cold or chill. Exposure to infection
Onset— Acute without fever (except pyelitis) Rigor unusual (except pyelitis) Vomiting usual. Pain often shifts downward	Acute with fever at start. Rigor common Vomiting less common Pain thoracic as well as abdominal.

EXAMINATION

Appearance— Varies from normal to abdominal facies	Cheeks flushed Alae nasi working Sometimes herpes on lips
Skin— Cold or clammy or normal	Skin may be hot and dry
Pulse and Respiration— No sure guide	$\frac{P}{R}$ ratio lessened
Abdominal wall— May be rigid	Less commonly rigid
Phrenic shoulder pain— Common but seldom below clavicle	Common especially below clavicle
Skin hyperæsthesia— Common	Rare and never below level of navel
Psoas test— Often positive	Always negative
Obturator test— Sometimes (rarely) positive	Always negative
Testicular pain— Sometimes present	Never present
Rectal examination— May elicit tenderness or demonstrate lump	Negative
Examination of chest— Frequently slight rubs in upper abdominal lesions	May be a rub or dullness or bronchial breathing but sometimes nothing definite at onset of symptoms

In cases which still remain doubtful after careful clinical examination, a small incision to the right of navel under morphine and local anæsthesia should be made

minute, and the superficial veins of the neck were pulsating visibly The liver was tender and enlarged down to the umbilicus Pain was felt down the left arm to the elbow I diagnosed cardiac failure and angina pectoris and refused to operate The patient died five hours later, and a post mortem examination of the abdominal cavity showed no gastric ulcer and no peritonitis The thorax was not examined but it was clear that the frequent attacks of indigestion had been slight attacks of angina pectoris The diagnosis of cardiac failure would not have given rise to so much doubt if the gastric lesion had not been so confidently diagnosed previously

Ordinary cardiac failure does not cause true rigidity of the abdominal wall though pressure on a tender swollen liver may elicit muscular resistance With acute pericarditis however there may be true rigidity of the abdominal wall, but this would be unaccompanied by other signs of abdominal disease With pericarditis also there may be phrenic referred pain felt under the left clavicle The significant pain down the left arm sometimes felt in cardiac disease may be helpful in diagnosis

DISEASES OF THE SPINE OR SPINAL CORD

OSTEOMYELITIS —Acute osteomyelitis of the dorsal or lumbar vertebræ may cause abdominal pain and rigidity, but there will be great tenderness on pressure over the affected part of the spine which will draw attention to the origin of the pain

In children acute abdominal (epigastric or umbilical) pain may be consequent on *Pott s disease of the spine* The absence of abdominal signs would naturally cause examination of the spine and detection of the spinal disease

TABES DORSALIS —This frequently causes severe abdominal pain in the form of *gastric crises* The crises though more common in adults may also occur in children who are the subject of juvenile tabes The pains may be very severe, and uncontrollable vomiting may occur The important point to remember is that the abdominal wall is not rigid in the intervals of the pain of a gastric crisis

When there is the slightest doubt about the diagnosis it should be made a rule to test the pupillary reactions and the knee jerks so that the mistake will not be made of advising an abdomen to be opened when the pains are caused by tabes dorsalis It must be recollected however that an acute abdomen may occur in a tabetic subject and one should not hesitate to advise operation if the local signs are definite A gastric crisis is occasionally mistaken for a perforated gastric ulcer though careful examination should easily prevent this a perforated ulcer has been sometimes misdiagnosed as a gastric crisis

simply because the patient was found to be suffering from tabes dorsalis It cannot be too strongly emphasized that persisting board like rigidity of the abdominal wall indicates something more than a tabetic crisis

RENAL DISEASE

Serious disease of the kidneys may cause uræmia, which may be accompanied by vomiting and abdominal distension Thus intestinal obstruction may be closely simulated This may occur in acute nephritis, chronic nephritis, bilateral cystic disease of the kidneys, or pyonephrosis

If in every case of intestinal obstruction one remembers the possibility of uræmia there should be no great difficulty in diagnosis by considering the differential points set out below

Intestinal obstruction	*Uræmia simulating obstruction*
Indication of renal failure absent	Tongue dry and furred great thirst
No albuminuria	Albuminuria of variable amount.
Vomiting tends to become fæculent.	*Vomiting not fæculent*
If obstruction low down absolute constipation of flatus and fæces	Bowels may return flatus after enema
May be history of subacute attack of obstruction	May be history of some surgical or medical disease of kidneys
No renal tumours	In cystic disease bilateral renal tumours found.
Blood pressure may be normal.	Blood pressure likely to be much raised

It is very seldom that the two conditions are confused when once the possibility of uræmia is considered

RETROPERITONEAL CONDITIONS

When one considers that the majority of the early symptoms of peritonitis are reflex in character, and that the nerve endings constituting the afferent part of the arc lie for the most part in the subperitoneal tissues it is no wonder that various irritating lesions in the space behind the peritoneum may closely simulate peritonitis Retroperitoneal effusions, *if considerable in amount*, may also displace the large bowel and cause obstruction

The chief lesions occurring in the retroperitoneal tissues and liable to cause difficulty in diagnosis (apart from acute pancreatitis) are

Rupture of aneurysm of aorta or any of the big abdominal vessels
Dissecting aortic aneurysm
Retroperitoneal hæmorrhage from injury of kidney, or spontaneous bleeding from renal growth
Retroperitoneal extravasation of bile

Retroperitoneal perforation of a duodenal ulcer
Extravasation of urine into extraperitoneal tissues from ruptured bladder ureter, or pelvis of kidney
Pelvic subperitoneal infections

In the early stages of many of these lesions it is extremely difficult if not impossible to diagnose with certainty from an intra peritoneal lesion but when a sufficient amount of blood, urine, or inflammatory fluid has collected in a part which can be examined diagnosis may be rendered more easy by a sign pointed out by Joyce This sign which is dependent upon the fact that a retro peritoneal effusion is not movable, consists in a sharp line of demarcation between a dull fixed area and the resonant remainder of the abdomen, it is of most value in perirenal extravasations, and in such cases the limiting line corresponds in position to the displaced ascending or descending colon whilst the dull area occupies the loin and lateral part of the abdomen

RUPTURE OF ANEURYSM —Retro peritoneal extravasation of blood from rupture of an aneurysm of the abdominal aorta or one of the big abdominal vessels constitutes a grave emergency which now holds out hope of being successfully treated by surgery Diagnosis may be possible when the patient has been known to be suffering from an aneurysm Sudden collapse and great abdominal pain would naturally direct one to the cause In the absence of any previous history diagnosis is often impossible The sudden appearance of a painful retro peritoneal swelling following collapse in a patient known to be suffering from severe arteriosclerosis might make one suspect the rupture of an aneurysm In a patient suffering from malignant endocarditis a mycotic aneurysm may form and rupture retro peritoneally with the immediate appearance of a painful swelling and local rigidity of the abdominal wall In one such case I made an erroneous diagnosis of perinephric abscess through not paying sufficient attention to the observation of a reliable observer that the swelling had not been there the night before I saw the patient.

DISSECTING AORTIC ANEURYSM —Dissecting aneurysm may cause very severe abdominal pain and occasionally local tenderness and rigidity of the abdominal wall It is therefore easy to understand how it may be mistaken for perforation of a peptic ulcer With dissecting aneurysm however the collapse is extreme and more lasting and the pain does not abate as soon as it does in the reactionary stage of a perforated ulcer, moreover the catastrophic pain always starts in the thorax and takes a few seconds to reach the abdomen The local disturbance of blood supply caused by a dissecting aneurysm may lead to a weak or absent pulse in one or other limb and this may be associ

ated with numbness and paræsthesia in the part affected The absence of other characteristic signs of a perforated ulcer should easily serve to distinguish between the two conditions

Severe mesenteric thrombosis causes symptoms very similar to those of dissecting aneurysm, and in the absence of a typical history I know no way of differentiating the two conditions

RETRO PERITONEAL EXTRAVASATION OF BILE —This is usually diagnosed only on opening the abdominal cavity It causes symptoms of subacute peritonitis

PELVIC SUBPERITONEAL INFECTIONS —These, if acute, may cause some intra peritoneal irritation We have seen such symptoms caused by spreading gas gangrene of the vulva, and J L Joyce (*Brit J Surg*, 12 No 47, 547 *et seq*) related a case in which severe abdominal symptoms followed on the mistaken injection of a soap and water enema into the perirectal tissues In such cases there is some peri toneal irritation, the exact extent of which can often only be told by exploration

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